The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. VII. No. 172 SEPTEMBER 30, 1922 Prepaid Annual Subscription United Kingdom, £1.1.0; Abroad, £1.6.0.

Contents

PAGE

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to THE CHEMICAL AGE is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, Money Orders and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial and General Offices—8, Bouverie St., London, E.C.4.

Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (6 lines).

Distribution of Reparation Dyestuffs

THE Board of Trade draw the attention of consumers of dyestuffs to the fact that the distribution of such quantities of dyestuffs as are obtained from Germany as reparation is now being carried out by the British Dyestuffs Corporation, Ltd., which company has been appointed agent of the Board of Trade in the matter as from September 1, 1922, in place of the Central Importing Agency. This change in agency has been accompanied by certain modifications of the arrangements formerly in force which it is hoped will prove to the advantage of consumers :—

(1) All prices now quoted will include delivery to purchasers' works or stores, and will not be subject to the 1 per cent. commission hitherto charged. (2) Such prices will be in respect of 60 lb., 120 lb., or 240 lb. packages (which will be free and not returnable), and a reduction of 1d. per lb. will be made on all purchases of 4 cwt. or upwards, while in the case of purchases of not less than one ton the standard price will be subject to a reduction of 2d. per pound. On the other hand, purchases of less than 60 lb. will be subject to an addition ranging from 1d. per pound in the case of 20 lb. lots to 3d. in the case of 1 lb. lots, to cover the cost of extra packing. (3) At the discretion of the British Dyestuffs Corporation thirty days credit on all accounts may be given.

In all other respects the British Dyestuffs Corporation will act solely under the direction of the Board of Trade, and will follow the practice hitherto in force of distributing the dyestuffs under their original German denominations, and as far as possible in their original packages.

Any additional quantities of dyestuffs which may be received from time to time will be reserved for a period of not less than fourteen days for actual consumers, and notification of arrival will continue to be given, as hitherto, through the Colour Users' Association, though, in addition, lists of stocks held and current prices will be issued periodically by the British Dyestuffs Corporation. The first of such periodic lists will be available in the course of the next few weeks. At the expiry of the period referred to above during which dyestuffs are reserved for consumers, they will be available to the trade generally. Prices will continue to be fixed by the Board of Trade, and will be reviewed from time to time in accordance with general market conditions. All inquiries on the subject should, in the first place, be addressed to the British Dyestuffs Corporation, Ltd., Reparation Department, 70, Spring Gardens, Manchester.

The Mechanism of Dust Explosions

WE were in conversation a day or two ago with a chemical engineer whose plant had recently suffered some considerable damage as the result of the explosion and subsequent ignition of dust in a closed tower down which coal was being passed for measurement and weighing. There appeared to be no apparent explanation of the occurrence, and our informant was anxious to know of any similar mishaps, the causes which give rise to them, and the means which may be adopted for their prevention. So far as the momentary heating of inflammable coal dusts is concerned, there was at one time—and still is, we believe—considerable controversy as to whether the dust particles unite directly with the oxygen of the air, or whether gas is instantaneously evolved from the dust prior to combustion, the suggestion being that the gas envelops each particle and propagates the flame from one to another. Whatever the mechanism of combustion, however, investigations have demonstrated that relative inflammability is almost directly proportional to the amount of volatile matter in the dust. Hence, by analogy, it might be reasoned that this fact indicates the relative ease of distillation, and thus supports the predistillation theory. One has, however, to bear in mind the explosions which have occurred with metallic dusts, such as aluminium or zinc, with which there can be no question of distillation; and such explosions have led some to believe that if mineral dusts of the kind can combine directly with the oxygen of the air then coal-dust particles may also unite with oxygen without predistillation.

The question is undoubtedly one of very general

interest, and we feel that we cannot do better than recommend those who are anxious to follow up the theory of the subject in detail to refer to a Report (No. 2306) which was issued by the U.S. Bureau of Mines in the early part of this year. The report refers to investigations conducted by Messrs. Guy Taylor, Horace C. Porter, and E. C. White, and it not only includes the original experiments of these investigators but gives a valuable summary of the work conducted in other countries. It is interesting to note that the authors of the Report concluded, as a result of two entirely different investigations in which radically different methods of igniting the dust cloud were employed, that it is at least possible to inflame coal-dust suspensions in air under conditions wherein the predistillation of the gas appears to be so slight that it cannot be considered an effective factor in causing ignition. The alternative explanation seems to be a direct attack upon the finely-divided dust by oxygen molecules; and although in some of the experiments tried, unmistakeable though slight quantities of combustible gas were found after momentary heating of the dust, the gas was mainly carbon monoxide, and no relation could be traced between its relative quantity and the known relative inflammability of the dusts. In spite of the fact that this American work seems to be the latest of its kind, we feel that our readers must not be permitted to overlook the investigations conducted in this country by Professor Wheeler and others.

Colloidal Fuel

Some of our readers have been inquiring lately as to what exactly is understood by the term "colloidal fuel," and they are anxious to know of the advantages associated with this comparatively new development in fuel technology. What is really meant by the term is, of course, a colloidal suspension of coal in a fuel oil, tar oil, or other suitable liquid fuel. The utilisation of coal dust has always been one of the great problems of the coal mining industry, and making use of it in suspension in oil appears to be the simplest and most straightforward way of consuming it. Apart from a few older attempts the first practical application of colloidal fuel was made in the United States during the war, and appropriately enough by the Submarine Defence Association. Dry coal was crushed to a fineness sufficient to pass through a two-hundred mesh screen. The viscosity of an oil alone is not sufficient to keep such comparatively coarse coal suspended. It is necessary to employ a fixateur, or stabiliser, which on an average forms about 1 per cent. of the mixture. After thorough incorporation in special machines a fairly stable suspension was obtained. Colloidal fuels contain 50 to 70 per cent. of carbon and 30 to 50 per cent. of oil. Those consisting of half and half carbon and oil form mobile pastes, while those containing more carbon constitute plastic masses. All these, however, become fluid when heated, and will flow freely through the pipes, preheaters, and burners designed for fuel oil. The mixture is stable for months, and any sediment which separates can be brought into suspension again simply by stirring.

The following is a brief list of advantages which are claimed for the new fuel :—(1) Consisting largely of inexpensive coal, it is much cheaper than fuel oil. The manufacture, also, costs very little. (2) Owing to its high specific gravity (higher than water) it occupies less volume than either coal or oil. (3) Its flash point is above 200° F. and it is not spontaneously inflammable. (4) It can be protected against fire by a layer of water. (5) It gives a perfect and smokeless combustion yielding a high temperature. The ash is free from clinker. (6) It permits of the utilisation of coal and oil wastes, and coal having as much as 25 per cent. of ash can be employed. (7) By using colloidal liquid coal it would be possible to obtain by means of Diesel motors a thermal effect superior to that produced with the aid of steam engines.

The practical exploitation of liquid coal appears already to have met with great success. In Great Britain liquid carbon should prove of the highest importance, as through its use we could replace 50 per cent. of fuel oil, which is expensive and has to be imported, by coal residues which are lying waste. Various industries would be involved in laying down the necessary plant and a large number of men would find employment. The introduction of a cheap liquid fuel would also enable us to compete more easily with oil producing countries.

A Recovery in Chemical Exports

As predicted in our review of the Board of Trade Returns for July, the large set-back in exports of chemicals, dyes, drugs, etc., which was recorded for that month, appears to have been merely a temporary one, for the August returns show a gratifying increase in exports amounting to no less that £217,966. With the exception of January, June was the best month of the year as far as chemicals are concerned, and the total for the month under review is only £122,502 short of that level. The apparently interminable succession of political crises tends to retard any noteworthy improvements in our overseas trade, and the only effective means of removing this drag on the wheels of Commerce is a vigorous and sustained endeavour to find new trade openings on the part of British manufacturers and merchants.

Our imports of chemicals during August were valued at £1,125,021, or £293,045 more than those admitted in July. This increase was largely accounted for by larger imports of sodium nitrate, potassium compounds, borax, and dyestuffs. Among the items showing a decrease are tartaric acid, crude glycerine, cream of tartar, natural indigo, and white lead.

The statistics relating to exports record a satisfactory recovery in shipments of sulphate of ammonia, glycerine anthracene, carbolic acid and naphthalene, but show noticeable decreases under bleaching powder, tar oil and creosote, benzol and toluol, copper sulphate, and sodium sulphate and carbonate.

A New Method of Fumigation

The comparatively stringent quarantine regulations which are now being enforced, more particularly by the United States authorities, would seem to be saddling the sanitation officials at the ports with a good deal of trouble. The problem of the effective fumigation of ships grows more complex as the furnishing and fitments of our ocean-going vessels become more elaborate. In fact, the old sulphur dioxide method which was employed with such success for the elimination of rats

and vermin has almost proved impracticable, owing to the damage which results to metal-work, and in some cases to cargo. Apart from this, sulphur dioxide is objectionable owing to its heavy nature and consequent tendency to linger for some considerable time in those confined spaces where ventilation is indifferent.

Our readers may have noticed that recently hydrocyanic acid has been used for fumigation. While it is free from the harmful effects of sulphur dioxide, it naturally, owing to the extremely toxic qualities of the gas, introduces dangers which have already been responsible for a couple of fatalities. We do not recollect hydrocyanic acid being used for such purposes before, although, of course, one's mind naturally goes back to the work of Coquillett and Bishop, to whose research at the Agricultural Experiment Station at California University the development of this gas as an insecticide was largely due. Within the last few years a 98 per cent. hydrocyanic acid has been placed on the market, thus avoiding the necessity for generating the gas on the spot from sodium cyanide and sulphuric acid. Perhaps the danger of HCN lies in the fact that it may be absorbed through all parts of the body, even through the skin, and its action is usually extremely rapid. In the case of the *Mauretania*, on which the two fatalities referred to occurred, the most elaborate precautions were observed, and yet they proved to be insufficient. There can be little question that as experience is gained the new method will become increasingly safe. and its application is unlikely to be impeded by the untoward results of these early trials.

One is tempted to ask, however, whether the port authorities have considered the alternative of water-gas. Just prior to the war ordinary blue-water gas was being largely employed for fumigation purposes in connection with ships and railway carriages in Germany, and at some of the frontier railway stations most elaborate treating chambers for railway cars were erected. From the point of view of vermin, water-gas seemed to prove most efficacious, but strictly from the bacteriological standpoint it might not be so satisfactory.

American Penetration of Europe

THERE is a good deal more than meets the eye in the endeavour of the American Government to keep free from political entanglements in Europe. Our cousins across the water put their business well in front of their politics, and it must not be supposed that they are neglecting the commercial possibilities of Europe. They may, indeed, find some satisfaction in the complete manner in which we have allowed our political interests to stand in the way of the reconstruction of European trade. Evidence on this point is forthcoming in an unexpected and indirect way from a perusal of the pages of *The European Commercial*, the new journal which is published in Vienna. In 50 pages of varied discussions of business matters in 20 different countries of Europe, the writers, who are in every case Englishmen, have fallen into the European habit of quoting the exchange in dollars. When one finds an English journalist in Warsaw discussing the commercial situation and in the most casual and natural way using the dollar in all his references to exchange matters, one gets a striking indication of the true state of affairs.

Assisting Russian Colleagues

SIR JAMES WALKER'S appeal on behalf of Russian men of science, which we publish on another page, is in no way less urgent than the one which was made this time last year, to which British chemists and others responded so handsomely. The money, clothing, books and other donations already supplied have done much to mitigate the acute and almost indescribable distress which has prevailed among men of science in Russia, but the condition of the country is still so bad that there is little doubt that the necessity will be no less acute during the coming winter than it was last year. It is therefore hoped that British chemists as a whole will make a point of sending some contribution, either in the form of money or clothing, books, etc. Of the total cash receipts from the last appeal—£214 2s. 7d.—£173 7s. 8d. was spent on clothing, while books and printing absorbed £11 17s. 9d., leaving a balance in hand of £28 17s. 2d. The Chemical Society will continue to act as the receiving depôt, and cheques and parcels will be gratefully received by Mr. S. E. Carr, at Burlington House, Piccadilly, London, W.1.

Points from our News Pages

A further instalment is published of our series of articles on the chemical markets of the world (p. 442).

Dr. Stephen Miall contributes an article in which he shows how X-ray and other spectra throw some light on the structure of atoms (p. 446).

Letters are published from Professor Alex. Findlay, Sir James Walker, "Dr. B. Lagueur," "Qualified Chemist," and W. W. Crosweller (p. 450).

On Tuesday the Referee appointed under Part I of the Safeguarding of Industries Act heard a complaint that gullic acid has been improperly excluded from the Board of Trade's list (p. 452).

A promising recovery in chemical exports is recorded in the Board of Trade Returns for August (p. 454).

Abstracts are given from some of the papers read at the autumn meeting of the Institute of Metals (p. 455).

According to our London Market Report there has been a distinct improvement in trade during the past week (p. 463).

Our Scottish Market Report records a quiet week with a fair number of inquiries, but little actual business (p. 465).

The Calendar

Oct.		
5	The Chemical Society: Ordinary Scientific Meeting. 8 p.m.	Burlington House, Piccadilly, W.1.
9–15	International Congress on Liquid Fuels.	Paris
11	Paint and Varnish Institute: Inaugural dinner	London.
13	Society of Chemical Industry: Annual London Dinner. 7 p.m.	Connaught Rooms, Great Queen Street, Kingsway, W.C.2.
14	The Mining Institute of Scotland: General meeting.	Edinburgh.
16	Institution of Rubber Industry	Midland Hotel, Manchester.
16	The Faraday Society and the British Cold Storage and Ice Association. Joint Meeting to discuss "The Generation of Low Temperatures." 2.30 to 4.4.45 to 6, and 7.45 to 10 p.m.	Institution of Electrical Engineers, Victoria Embankment, W.C.2.
23	Institute of Chemistry (Huddersfield Section): "The present position and future prospects of the Institute and the Profession." The Registrar of the Institute.	Huddersfield.

The Chemical Markets of the World

Trading Fields for Manufacturers and Merchants

The following specially prepared collection of notes relating to overseas markets for chemicals, dyes and drugs forms the last instalment of an exclusive series of articles which have appeared in THE CHEMICAL AGE *from time to time. Every market in the world possessing possibilities for trade in chemicals has been dealt with, and the series may be taken as a concise indication of the fields capable of further development. Acknowledgment is made of the valuable assistance rendered by officials of the Department of Overseas Trade in the compilation of these notes.*

Guatemala

THERE is a considerable importation into the Republic of Guatemala of chemicals of various kinds, particularly medicines and drugs. The total imports in 1919 under the heading of "Medicines and Drugs" are given by the Statistical Department of the Guatemala Customs as:—weight, 701,427 kilograms; value, $449,494 (United States currency). No details are available as to the particular medicines, drugs, etc., which were imported, but information is given as to the countries of origin, from which it appears that over 70 per cent. of the total importation came from the United States, and the remainder almost entirely from France and the United Kingdom, the actual figures being:

United States ..	575,421 kilos.	$320,466
France	56,891 „	$76,892
United Kingdom ..	67,519 „	$49,400

A comparison with the average of two previous years indicates that the total value of the imports from the United States has gone up 70 per cent. and those from the United Kingdom and France over 100 per cent., which may indicate that some of the ground inevitably lost by ourselves and France during the war is being recovered. It will, however, be noted that the preponderance of the United States is still extremely marked.

As far as can be ascertained, the principal chemicals for which there is a demand in the Republic of Guatemala are as follows:—HEAVY CHEMICALS: Epsom salts; Glauber salts; carbolic acid; boracic acid; borax; cream of tartar; bicarbonate of soda; nitrate of potash; oxide of zinc. PHARMACEUTICAL CHEMICALS: Phenazonum; phenacetin; acid salicylic; sodium bromide; potassium bromide; ammonium bromide; and various proprietary articles.

Trading Conditions

Under the Customs regulations of Guatemala all chemicals, drugs, etc., must be imported by recognised pharmacists. In practice goods of this nature are to a certain extent imported by retail druggists, but a more important market is that of the one wholesale house in Guatemala City, Messrs. Lanquetin, Castaing and Co., which supplies retail druggists throughout the country, and also has its own retail branch.

The conditions of trading usually obtaining appear to be that the retailers who import direct are expected to pay cash either with order or against documents.

Cuba

There is a good market here for glacial acetic acid, citric acid, oxalic acid and tartaric acid. Owing to the proximity of the States to Cuba, American prices for nitric and sulphuric acids are probably so low as to make British competition ineffective. There is also a good demand for carbonate of ammonia and for liquid ammonia as well as for muriate and phosphate of ammonia. Arsenic is used, mixed with other chemicals, as an insecticide. Bleaching powder is imported in large quantities. There is also a demand for calcium chloride, caustic potash (solid), chlorate of potash, copperas, disinfectant fluid (soluble), naphthalene balls, naphthalene flake, paraffin wax, potassium bromide, carbonate, cyanide and muriate, sulphate of quinine, rhodamin, salol, salammoniac (lump), sodium bisulphite, sodium hyposulphite (pea size), sodium sulphate, sulphate of alumina (paper makers' quality), sulphate of copper.

With respect to formaldehyde (liquid), and hexamethylene tetramine, American competition would probably be strong. Other chemical products are imported in small quantities.

Cuba is an excellent market for proprietary medicines and medicinal chemicals in general. There is scarcely a village in the island which has not one, and in most cases two, or even more, druggists.

Haiti

The demand for chemicals and drugs in Haiti is not large, and the quantities imported from the United Kingdom are practically negligible. The general trade conditions of the Republic are very bad at present. During 1919-1920 fairly large imports of goods were made at high prices, and these goods in many cases still remain unsold. Owing to the very big fall in prices obtained for Haitian produce, money has been very tight, with the result that there are on hand large surplus stocks of imported goods.

The following are the latest statistics obtainable in regard to the importation of chemicals and pharmaceutical products:—

Countries of Origin.	Values in American dollars. 1917-18.	1918-19.	1919-20.
U.S.A.	41,514.66	80,189.78	141,795
France	10,160.25	25,767.21	64,083
U.K.	81.01	8.00	—
Other Countries	1,805.60	1,097.87	150
Totals	53,561.52	107,062.86	206,028

Dominican Republic

Business conditions in this Republic are at present very unsatisfactory, and great care should be exercised in granting credit. A general period of depression exists, due to the decline in the price of the country's products, and for some months past importations have been very limited and sales slow. There is a heavy stock of all kinds of goods which merchants have been unable to dispose of as rapidly as in the past, and it will be many months before they are able to work into an easier position.

The following are likely agents for chemicals, drugs, etc.:
L. Preetzmann-Aggerholm, Santo Domingo City.
B. Ravelo, Santo Domingo City.
Antilles Trading Co., Santiago, D.R.

There is not a very large market for chemical products in this country, but as roads are built across the Republic and intercommunication becomes more feasible, the market should steadily increase. At present it is practically necessary to appoint separate agents for the north and south. The Royal Mail Steam Packet Company have monthly cargo boats from London to Sanchez and Puerto

Plata, the two ports which serve the rich interior plain with the towns of Santiago, La Vega and San Francisco de Macoris. The only two railways run from these ports into the interior. When sufficient cargo offers the Royal Mail Co. send their boat also to San Pedro de Macoris and Santo Domingo City on the south coast. Unless the Royal Mail calls at these two latter ports goods for firms in the south should be sent *via* the boats of La Compagnie Generale Transatlantique from France or *via* the boats of the Dutch Royal West Indies Mail from Rotterdam, as the cost of transhipment and freight between the different ports of the Republic is practically prohibitive.

Chemical and pharmaceutical products are listed under items Nos. 369 to 391, Group III., in the tariff, which may be seen at the Department of Overseas Trade, London.

The following firms would probably be interested in the importation of chemicals. Dominican firms are shy of buying from catalogues, and in the first place desire to see samples :—F. Baehr and Co., Luis A. Serrati, J. Anibal Cruz, Lebron and Co., C. por A., L. Baquero and Hno., Juan Read.

Correspondence with firms in Santo Domingo should be preferably in Spanish, and prices should be quoted in dollars c.i.f. Dominican ports, though there are some firms who might consider quotations in sterling on the chance of making extra profits on the fluctuating exchanges.

The total values of chemical and pharmaceutical goods imported into the Dominican Republic (as given in the Annual Report for 1921) during 1913, 1919 and 1920 were as follows :—1913, 212,834 dollars ; 1919, 530,836 dollars ; 1920, 1,018,557 dollars.

The U.S.A. hold a commanding influence in the market. The percentages of total imports into the Republic during 1913, 1919, 1920, and the first six months of 1921 were as follows in the case of the U.S.A. and Great Britain :—

Percentage of Total Imports.

	1913	1919	1920	First six months 1921
U.S.A.	62.30	82.26	77.05	83.88
Great Britain	7.80	1.57	3.30	2.63

Mexico

No chemicals or drugs are manufactured in Mexico everything in these lines being imported. A large business is done in heavy chemicals such as caustic soda, china clay, cyanide, copperas, and other chemicals used in the manufacture of soap and dyes, etc., and employed in mining operations and reduction works. The principal importing chemical houses of British nationality are :—Watson Phillips, Apartado 67, Mexico City ; William Young and Co., Ave. Salvador 102, Mexico City ; Munro and Co., Condesa 16, Mexico City.

The trade, however, is largely in the hands of the larger German houses, who usually maintain large stocks of all sorts of chemicals. In the dye trade they control most of the connections and keep their own chemists in the country for the purpose.

Practically all the patent medicines appear to be purchased from dealers abroad. The largest trade in medicine is done by the Americans, although certain British medicines are well known here. Serums are practically all American, as fresh supplies can quickly be sent in from the United States by parcel post.

Spain

Purchases from abroad are somewhat checked by the increases in the customs duties, and a careful study should be made of the customs tariff.

Since the war, French, Belgian and Dutch firms have contrived to gain a foothold where before British products had to face little competition ; the market for quinine and alkaloids may be taken as an example. Most of these firms give ninety days' credit and other facilities for payment. German competition is rapidly winning back its lost position in Spain, but the recent tariff change which seriously increases the import duty upon all goods coming from Germany is calculated to render German competition less severe.

The following lines may be mentioned as being specially suitable for this market :—citric acid, tartaric acid, ammonia carbonate. Among other chemicals, etc., for which there is a market in Spain are :—Acids : citric, oxalic, tartaric ; ammonia : carbonate, muriate (grey), salammoniac (lump), boracic acid (commercial crystals), borax, naphthalene, all qualities ; potash : bichromate and prussiate (yellow) ; soda : bichromate, nitrate and prussiate ; ochre ; paraffin wax and scale ; dextrine and farina.

Portugal

Portugal is in normal times a fair market for chemicals, drugs, proprietary medicines, etc., the principal countries competing for the trade being Great Britain, United States of America, France, Spain and Germany. Before the war large supplies were obtained from Germany and, according to recent reports, German goods are once again entering the market in fair quantities.

The greatly depreciated value of the escudo (present value about 4d. as against a par value of 4s. 5d.) is responsible for the very serious commercial depression prevailing in Portugal, and the market is a bad one at the present time for all classes of goods originating from countries like England, where the exchange is so much against Portugal.

Considerable quantities of sulphate of copper, sodium nitrate and other chemicals used for industrial purposes are imported. The following figures regarding the importation of copper sulphate are taken from the official Portuguese Import Statistics :—

Country of Origin.	Value in Escudos. 1913.	1919.
Great Britain	536,159	644,135
U.S.A.	—	17,048
France	3,856	—
Other countries (not specified)	32	2,477
	540,047	663,660

The following are the values of the principal chemical products imported into Portugal during 1919 (excluding made-up medicines) :—

Country of Origin.	Value in Escudos.
Germany	2,277
Belgium	561
Spain	481,082
U.S.A.	1,325,207
Brazil	108
France	251,443
Great Britain	2,052,203
Portuguese West Africa	360
„ East „	70
Other countries	447,790
	4,561,101

The principal chemicals mentioned in the list of imports are : carbonate of soda, calcium and potash, sulphates of copper and soda, chlorate of calcium, nitrates of potash and soda, caustic alkalis, salts of quinine, etc. Fertilisers are imported in fairly large quantities, the total value for 1919 being given as 1,465,520 escudos as against the value of 1,313,213 escudos imported in 1913. Of the fertilisers imported in 1919, the imports from Great Britain were valued at 686,263 escudos. The other principal suppliers were France, Spain, Chile and the United States of America.

Dyes and colours (crude and in powder) were imported in 1919 to a total value of 758,935 escudos, Great Britain's share being valued at 333,048 escudos. Other suppliers were U.S.A., Spain, France, Switzerland, Germany, Holland and Belgium. Dyeing extracts imported from Spain, Great Britain, Argentina, etc., represented a total value of 263,368 escudos.

Medicinal compounds and preparations of a total value of 221,815 escudos were imported in 1919. Imports from Great Britain were valued at 24,598 escudos. The bulk of the supplies were obtained from France, the other principal suppliers being Spain and U.S.A. The figures quoted are taken from the published Portuguese import returns, and must be accepted with a certain amount of reserve.

Brazil

According to the Brazilian official import returns the total value of manufactured chemical products, drugs and pharmaceutical specialities imported into Brazil during 1913 and 1920 was £1,406,302 and £3,246,230 respectively.

Unenumerated imports under this class amounted in value to £1,067,635 in 1913, and to £2,306,800 in 1920, but among the principal items specified were :—

	1913.		1920.	
	Kilos.	£	Kilos.	£
Caustic soda	7,581,385	105,292	12,036,836	506,180
Carbide of calcium	5,637,606	87,654	927,142	32,858
Chemical manures	9,471,031	88,941	368,024	9,819
Acids (unenumerated)	418,831	28,261	488,803	104,061
,, acetic	314,394	11,060	210,735	21,526
,, sulphuric	800,694	11,845	691,162	57,525
,, nitric	8,968	616	13,290	2,382
,, tannic	15,639	2,439	40,138	18,091
Medicinal capsules, pills, globules	7,034	10,466	29,031	60,597
Chloride of lime	1,014,017	12,226	1,481,601	57,303
Petroleum jelly	139,508	9,884	100,174	25,043
Cod liver oil and emulsion	60,908	5,134	57,256	20,454

In addition to the above " substances for the manufacture of perfumery, dyes, paints, etc.," are shown in the Brazilian import returns in a separate group. The total value of imports under this class in 1913 and 1920 respectively was £653,344 and £2,384,733, of which the unenumerated imports amounted to £42,214 and £400,837. The imports specified in this class with the exception of linseed oil, turpentine, ultramarine blue and animal charcoal were :—

	Kilos.	£	Kilos.	£
Aniline dyes	431,112	117,611	629,147	556,976
White zinc paints	3,328,127	96,661	3,653,281	281,655
Dry paints	2,464,714	71,826	508,556	41,477
Soda ash or potash	7,077,764	51,464	6,266,423	108,987
White lead	123,466	3,321	143,529	11,503
Red lead	524,731	15,943	301,694	22,864
Artificial essences and unenumerated oils	25,549	30,356	55,449	144,515

Caustic Soda

From the above figures it will be seen that there is a good market for caustic soda in Brazil. The chief suppliers in 1913 and 1920 were :—

	1913. Kilos.	1920. Kilos.
United States	66,390	7,775,771
United Kingdom	7,262,922	4,226,422
Germany	114,915	—

The principal ports of importation in 1920 were :—Rio de Janeiro, 4,356,025 kilos ; Sao Paulo, 4,346,592 kilos. ; Pernambuco, 1,065,252 kilos.

In March, 1918, the Brazilian Government published a decree authorising financial assistance to be given under certain conditions to the first three enterprises manufacturing caustic soda in Brazil. The erection of several factories was commenced, and it is stated that one or two have been completed. In February, 1919, His Majesty's Consul-General at Rio de Janeiro reported that local importers did not regard the possibility of competition from local factories with any great apprehension.

SALTPETRE—The imports of saltpetre into Brazil during 1913 amounted to 2,457 tons, valued at £55,798. Of this 1,025 tons came from Chile, 745 tons from Germany, and 690 from the United Kingdom. In 1920 the total imports were 2,136 tons valued at £142,297.

NITRATE OF POTASH.—Deposits of nitrate of potash are said to exist in various States of Brazil. The only deposits known to be worked are in the State of Bahia, and it is understood the product is supplied to the few gunpowder factories in operation in the country.

SULPHITE AND BISULPHITE OF SODA.—His Majesty's Consul-General at Rio de Janeiro has reported that these chemicals are not used locally in the treatment of raw rubber. Almost all the raw rubber produced in Brazil is exported in its crude state, and the Brazilian manufacture of rubber products is very limited, being practically in the hands of two firms.

The principal industries in Brazil employing chemicals and chemical products are the textile, soap, perfumery, tanning, match and glass industries.

There is very little sheep dip sold in Brazil, except in the State of Rio Grande do Sul, where sheep breeding is growing into a very large business, but British firms should make a bid for the rapidly developing trade in cattle tick dips. The cattle breeders in Sao Paulo and parts of Minas Geraes are becoming alive to the necessity of dipping their cattle, and besides the losses incurred by the set-back to fattening stock, the packing house buyers are becoming more strict each year in insisting on discounts on tick cattle for the reason that they in turn are having a large number of hides rejected by the buyers for tick damage.

A good tick dip is manufactured in the Argentine by the Companhia Primitiva de Gas, and is of a coal tar origin.

At the present time there is an American firm of paint manufacturers trying to place its arsenical cattle tick dip on the market, but they are not meeting with very great success. Early last year a consignment of 54 gallon drums was offered at Rs.80$000, but the last consignment of 5-gallon drums received this year works out at Rs.53$000 each, owing to an advance in the first cost and unfavourable exchange, but it is an excessive price. Any sheep tick dip offered for sale in Brazil must be previously tested and approved by the " Servico Industrial Pastoril " of the Ministry of Agriculture (Rua Matta Machado, Rio de Janeiro). This test was formerly optional, though in practice invariably requested by those interested in the sale of such articles.

The following statistics relating to imports of perfumery into Brazil are compiled from Brazilian official statistics :—

Countries of Origin.	1913.	1915.	1916.	1917.	1918.
Germany	33	2	—	—	—
United States	64	25	46	56	66
France	402	230	304	189	309
United Kingdom	49	18	23	18	27
Other countries	22	9	12	10	10
Total (metric tons)	570	284	385	273	412
Value (£1,000)	235	120	180	159	293

Principal ports of destination in Brazil, 1913 and 1918 :—

	Metric Tons. 1913.	1918.
Rio de Janeiro	279	198
Santos	123	118
Bahia	39	19
Pernambuco	24	32
Para	21	11

Imports of perfumery for 1919 amounted to 479,193 kilos, valued at £364,996 for 1920, to 824,900 kilos, valued at £659,471, and for 1921 (January to September), 207,709 kilos, valued at £193,393.

Chile

During the war many small importers of drugs established themselves. When the Armistice came, all these importers were left with stocks on their hands, so that for some time the market here was very much overstocked. Stocks have been greatly reduced, but German competition is now very severe in all lines. The United States appear to have quite lost the market gained during the war. Their prices are high and their methods of doing business frequently fail to give satisfaction.

The new import duties, which came into effect in February, 1921, together with the unprecedentedly low exchange, has made importation somewhat hazardous. This applies especially to all goods coming under the heading of perfumery, the duties on which were doubled—for instance, imported Eau de Cologne now costs so much that it is practically unsaleable. Medicinal soaps now pay ten times the duty, and are absolutely unsaleable. Until exchange becomes more normal, much importation cannot be expected. Most of the importing houses are now living, as far as possible, on surviving stocks or on "hand to mouth" orders.

Manufacturers who wish to introduce new pharmaceutical preparations into this market should arrange to canvass the doctors here, either by personal visits, through a local agent, or by samples and literature forwarded direct. This method gives much better results than newspaper advertising. A very considerable demand for proprietary articles exists throughout Chile, but the bulk of these are French and American products. Several, however, are manufactured in the country.

Heavy Chemicals

Recent statistics in regard to the import into Chile of heavy chemicals are not obtainable. The following were the most important imports in this line in 1918 and 1919 (all figures in metric tons). :—

	1918.	1919.
Caustic soda	1.235	1.329
Calcium carbide	2.052	1.738
Calcined sodium carbonate	4.127	1.263
Sulphuric acid	245	307
Sodium silicate	not stated	367
Hydrogen peroxide	70	105
Quinine	91	559
Various magnesium salts	105	not stated
Magnesium sulphate	not stated	51
Liquid ammonia	57	77
Sodium sulphate	not stated	79
Potassium chlorate	75	149

The demand for sodium sulphate, about 800 tons per annum before the war, is now satisfied almost entirely by local manufacture in the National Factory in Santiago de Chile. There is normally a good demand for British heavy chemicals. Terms of payment are usually 90 days' sight draft against documents.

Uruguay

A substantial business is done in Uruguay in heavy chemicals, and amongst the articles in demand may be mentioned the following :—caustic soda, sulphate of alumina, sodium sulphide, sulphate of soda, tartaric acid, vitriol, all other acids, alkali, patent soda, alum cake, ammonia (carbonate, chloride and liquid), beeswax, bicarbonate of soda, bichromates, bleaching liquor and powder, calcium carbide, calcium chloride, chloride of lime, cream of tartar, Glauber's salts and magnesium chloride. There is also a demand for all kinds of pharmaceutical chemicals. Complete sets of samples should always be sent, and if the agent interests local buyers, he will then cable for c.i.f. prices.

TARTARIC CRYSTALS.—The Mendoza wine trade consumes large quantities of this crystal, and trade with Argentina in this article is always good. A demand, although on a necessarily smaller scale, also exists in Uruguay both for tartaric crystals and tartaric baking powder.

CREOSOTE.—There is a scarcity of this article, for which there is always a good demand ; the annual demand may be estimated at 100 tons for Montevideo.

ARSENIC.—Silesian German 99 per cent. has been largely used in the past. Quotations should be made as low as possible, competition being very severe.

The preference of the local buyers is always for the British article, but American manufacturers are still doing considerable business and are cutting prices to the lowest possible figure. It is imperative that United Kingdom manufacturers should make every endeavour to quote at prices which will be acceptable to this keen cut market, even to the extent of relegating the question of profits to a secondary place for the time being, particularly in view of both American and German competition. German chemicals, drugs and dyes are coming on the market in increasing quantities.

In choosing a representative it is important to appoint a man who is working for his living, and not entrust one's agency to a firm merely because it is old-established ; such a firm may have neither time nor inclination to push new business. Samples of pharmaceutical chemicals should be sent at once to the representative, and the lowest possible prices quoted. The agent should then be able to inform his principals, within a month, whether there is any likelihood of business in this market. All telegrams for orders exceeding £300 are paid for by the manufacturers. The representative should be appointed sole agent on the basis of taking orders from local firms on a commission basis, which, in this line of trade, is 2½ per cent. plus "over price" that the agent may be able to obtain.

With regard to credit conditions and terms of payment, it is absolutely essential to quote c.i.f. cash against documents Montevideo. In the case of first-class firms approved by a local British bank who may ask for 90 days' credit, the credit should be granted. Ninety days' drafts are on the following basis :—On receipt of the shipping documents and on arrival of the goods (the shipping documents and draft are sent to a British bank for collection and the goods are consigned "to order") the bank presents the draft to the purchaser, and on his endorsing his responsibility thereon the bank hands him the shipping documents. If on presentation of a 90 days' draft the purchaser has changed his mind and does not desire to avail himself of the credit facilities, but wishes to meet the draft immediately he is allowed a discount of 2½ per cent. for cash. Immediately a 90 days' draft becomes payable it bears interest at the rate of 6 per cent. per annum from the day it falls due to the time it is met. An agent always asks his manufacturers for quotations "cash against documents at port arrival" (except in very special cases), and if a local buyer desires to place his order at 90 days and is approved by a local British bank the order is then booked at the quotation received plus 2½ per cent. to cover the 90 days' credit. In some cases buyers may be requested to open a credit (confirmed) with a bank for payment against shipping documents in the port of arrival.

Argentine Republic

As a detailed report on the market for heavy chemicals in the Argentine Republic has recently been published, it is unnecessary to deal with this market on the present occasion. The report, which was prepared by the Buenos Aires branch of the Anglo-South American Bank, Ltd., is obtainable from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. The reference number is 3054/F.L.

Atoms and their Spectra

By Dr. Stephen Miall

In this article Dr. Miall deals with X-Ray and other spectra, and shows how these throw some light on the structure of atoms.

In *The Critic*, one scene opens with a clock striking which "saves a description of the rising sun, and a great deal about gilding the eastern hemisphere." This economy is worthy of imitation, and we therefore omit some beautiful passages describing the emotions of the primitive savage on first beholding the rainbow, some others on the optical knowledge of the Egyptians, Greeks and Arabians, and merely mention Kepler, who had some rough ideas about the diffraction of light, and Newton, who, in 1669 and 1670, made an accurate study of the solar spectrum and gave a fairly complete explanation of the rainbow.

Thomas Melville in 1752 gave an account of the yellow colour which sodium contributes to a flame. Five and twenty years afterwards, Scheele made an investigation of the chemical activity of the various parts of the solar spectrum, and in 1800 Herschell traced out the heating effect of the different areas of the same spectrum, and discovered the infra-red region.

A considerable advance was made by Wollaston, who in 1802 used a narrow slit for the admission of light before its diffraction through a prism. His apparatus was so exact and cleverly constructed that he observed the dark lines in the solar spectrum, but he did not recognise the importance of this discovery and turned his attention to other matters.

In 1814 Fraunhofer studied these dark lines, mapped and described some three hundred of them, gave the most important of them a distinctive lettering, and even measured their wave lengths by means of the diffraction grating which he invented. Though he was unable to explain how the lines came to be present, he was able, by comparing the sun's spectrum with the spectra of certain stars, to suggest that some of the dark lines had their origin in the sun or the stars. It took another forty years or more to give a proper explanation of these lines. Herschell, between the years 1822 and 1827, worked at the spectra of various coloured flames and showed that these provided a method for the detection of very small quantities of various elements, and Fox Talbot, in 1826, propounded a theory that each substance had its own characteristic spectrum lines, and that a glance at the spectrum of a flame would enable substances to be identified which would otherwise require a tedious chemical analysis.

As so often happens, the subject of spectrum analysis was being studied on two or three converging lines. Wollaston was the first to detect the dark lines of the solar spectrum and the bright lines shown by certain electric spark spectra. Fraunhofer went far in his study of the dark lines, and these are rightly named the Fraunhofer lines. Herschell and Fox Talbot increased our knowledge of the bright line spectra, and Wheatstone in 1835 published drawings of a good many of these. The connection between the bright lines and the dark lines was unknown, and the first step towards the solution of the problem was taken by Angström, who in 1853 stated that at a proper temperature bodies absorb the same vibrations which they are capable of producing.

This is comparable to other well-known phenomena. The middle C wire in a piano, if struck, gives out a note with a certain number of vibrations per second. If this C is sung or produced by a violin or any other instrument in the vicinity of the piano this C wire of the piano begins to vibrate and absorbs in the process some of the sound produced by the voice or other instrument. A similar explanation is that suggested by Angström, and this was proved to be the correct one by Kirchhoff and Bunsen in 1859; these mapped a very large number of spectra and showed how to make use of the lines they observed to identify the known elements and discover new ones. Kirchhoff and Bunsen, Huggins, Lecoq de Boisbaudran and Lockyer all made notable contributions to the science, and about the year 1880 attention was directed to the numerical relationship between the lines in the spectra of the various elements. Angström measured with great care the wave lengths of a large number of lines, and adopted as the unit $\frac{1}{100,000,000}$ of a centimetre, known to this day as the Angström unit. The visible spectrum stretches from rays with a wave-length of about 7,700 A. units at the red end to rays with a wave-length of about 3,700 A. units at the violet end. The ultra-violet spectrum has been mapped by a number of observers from about 3,700 A. units to about 700 A. units, and the infra-red spectrum has been mapped from about 13,000 A. units to about 7,700 A. units. The principal Fraunhofer lines have been carefully measured and identified with the elements to which they belong; of these lines A and B are oxygen lines due to the earth's atmosphere, the lines C, D, E, F, G, and H, belong to hydrogen, sodium, iron and calcium contained in the sun's atmosphere. Some of these lines are complex, as appears from the following table taken from Professor Urbain's book on spectro-chemistry:—

Line.	Region.	Wave Length.	Element.
A	Extreme red	7,594	O
B	Red	6,867	O
C	Red	6,563	H
D	Yellow.....................	5,896 5,890	Na Na
E	Green	5,270 5,270 5,269	Fe Ca Fe
F	Blue.......................	4,861	H
G	Indigo.....................	4,308 4,307	Fe Ca
H	Extreme violet	3,968	Ca

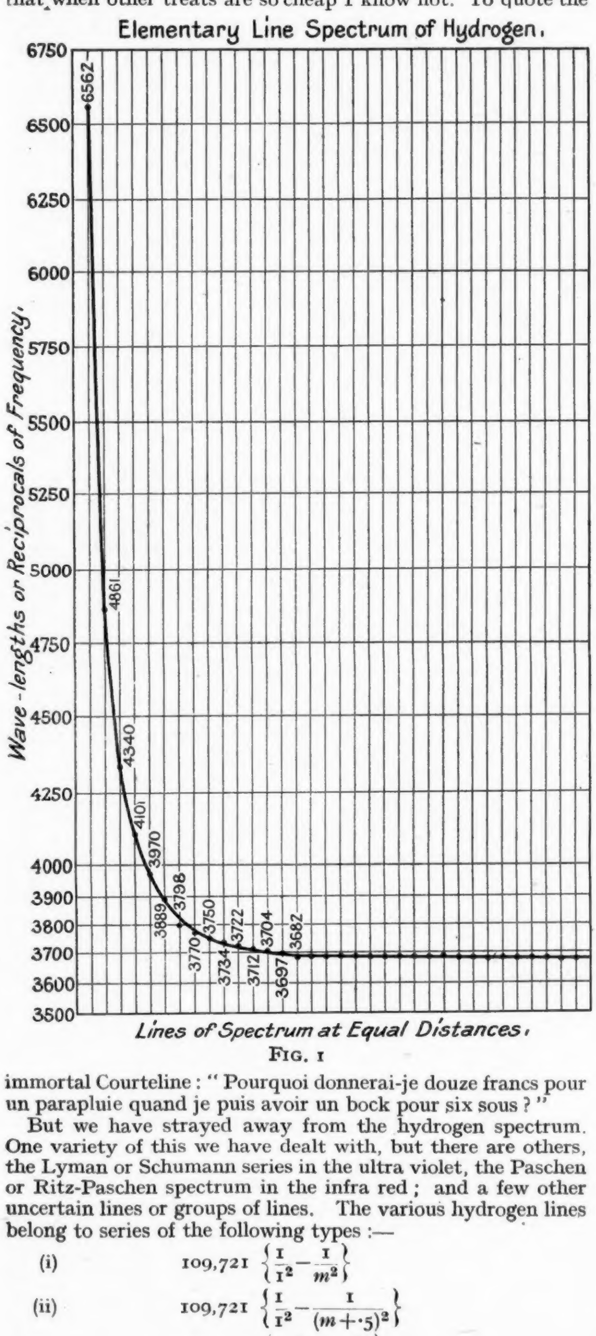
The simplest element is hydrogen, and the simplest spectrum is that of hydrogen, but even this turns out to be quite complicated enough for most people. Forty years ago the spectrum of hydrogen consisted of four bright lines with wave lengths of 6,563, 4,861, 4,340 and 4,101 A. units, and the problem was to find some relationship between these numbers. Liveing and Dewar had shown in 1879, 1880 and 1881 that some elements had a series of lines which though not exactly related, as are the wave-lengths of the harmonics of a string, nevertheless approximated to such a function. This proved to be a valuable hint, and Balmer, a Swiss physicist, in 1885 showed that the wave-lengths of the hydrogen lines were fairly close to those given by these formulæ:—

$$\text{Wave-length} = \frac{3,645 \times 3^2}{3^2-4},\ \frac{3,645 \times 4^2}{4^2-4},\ \frac{3,645 \times 5^2}{5^2-4} \text{ and } \frac{3,645 \times 6^2}{6^2-4}.$$

While Balmer was working out this mathematically, some of the astronomers were engaged in tracing hydrogen in various stars, planets such as Jupiter, and fixed stars such as Vega, Sirius and Arcturus. Huggins and Stoney found in the spectrum of Vega a number of dark bands which seemed to be due to hydrogen, and these gave us a further number of hydrogen lines which were subsequently found to agree satisfactorily with the later terms of Balmer's formula. Other observers have in the spectra of various stars discovered other hydrogen lines, and some of these have been also obtained from hydrogen spectra in the laboratory. Altogether five or six different spectra of hydrogen can be obtained, and the lines of one of these are approximately represented by the Balmer formula already given, and more accurately by a slight modification of it due to Rydberg, Curtis and others. The hydrogen lines of this series, now some 37 in number, are measured to two or three places of decimals of Angström units, and to get perfect accuracy the formula requires a little humouring, but broadly speaking the Balmer formula is good enough for most purposes. Two dozen or so of the hydrogen lines are shown in Figure 1. The lines of the hydrogen spectrum are due to some sort of systematic vibrations which in normal circumstances get fainter and fainter as they get more complicated.

The helium spectrum includes six such series, and a few others not so readily explained. The six series of helium are classified as Principal, Sharp and Diffuse, two of each, and all these series are approximately represented by formulæ of the Balmer or Rydberg type. So too with many of the other elements. Very patient and inquisitive readers will find

details in Dr. Hicks's *Treatise on the Analysis of Spectra*; a book I cannot recommend for the sands of Frinton or the shingle of Aldeburgh; there are no conversations in it and very few pictures, and I have not really read it through from cover to cover myself. Why anyone should buy a book like that when other treats are so cheap I know not. To quote the



Lines of Spectrum at Equal Distances.

FIG. 1

immortal Courteline: "Pourquoi donnerai-je douze francs pour un parapluie quand je puis avoir un bock pour six sous?"

But we have strayed away from the hydrogen spectrum. One variety of this we have dealt with, but there are others, the Lyman or Schumann series in the ultra violet, the Paschen or Ritz-Paschen spectrum in the infra red; and a few other uncertain lines or groups of lines. The various hydrogen lines belong to series of the following types:—

(i) $$109{,}721\left\{\frac{1}{1^2}-\frac{1}{m^2}\right\}$$

(ii) $$109{,}721\left\{\frac{1}{1^2}-\frac{1}{(m+\cdot 5)^2}\right\}$$

(iii) $$109{,}721\left\{\frac{1}{(1\cdot 5)^2}-\frac{1}{m^2}\right\}$$

(iv) $$109{,}721\left\{\frac{1}{2^2}-\frac{1}{m^2}\right\}$$

If we put for m the numbers 1, 2, 3, 4, etc., we get the frequencies of the lines of different spectra. Formula (iv) gives us the frequencies of the usual hydrogen spectrum already shown in diagram 1, the Balmer series. Formula (i) gives the Lyman series.

Professor Bohr, of Copenhagen, in the last eight years has studied the mathematics of a hydrogen atom consisting of a positive nucleus with a negative electron rotating about it. By taking the known data and making some probable assumptions as to the connection between rotating electrons and the emission of vibrations of light he calculated the diameter of a hydrogen atom, the frequency of a revolving electron, the electric potential required to separate the electron from the nucleus, and some other items. The majority of his calculations agreed closely with calculations made by other people from independent data. He stated that there should be a hydrogen line with a wave-length of about 1,216, and this was subsequently detected by Lyman as the first term in his series. It is the first term of the series (i) mentioned above; the second term of this series (i) has a wave-length of 1,025; this latter line has recently been observed by Saunders.

It can be shown from Bohr's theory that the values for the first terms of the Lyman, Balmer and Paschen's series should be the same as the X-ray spectrum of the K, L and M series respectively if these existed and could be observed in the case of hydrogen. It is easy to calculate from any diagram of X-ray spectra that if the curve of the K series be produced to reach hydrogen, the wave-length comes to about 1,200, and I am assured that it is possible, though not so easy, to show that a corresponding statement is also true of the L and M series of X-rays. Bohr's theory of a rotating electron has some striking successes, but it also has some signal failures, and cannot be taken as a final statement of the position. But if this is an elementary account of some of the simpler aspects of the spectrum of the most primitive element, the complexity of some of the other spectra will make us shudder.

The spectroscopic examination of the stars suggests that the elements are gradually built up out of hydrogen and helium, and that some of the stars which contain a variety of elements of high atomic weight are slowly and steadily disintegrating into their original hydrogen and helium.

There are some other phenomena connected with spectra which indicate that the electrons are rotating, at any rate when light is emitted. For instance, the Zeeman effect or spreading of spectral lines by a magnetic field can be explained on this supposition. The Langmuir octet theory demands an outer ring of stationary electrons, and it is not easy to reconcile this with the views of Bohr. Probably neither theory is correct, and yet each has some germs of truth in it. We do not know enough facts yet, and the man who goes into great detail in describing the position and movements of electrons 'means not, but blunders round about a meaning." It is better that he should do this than write about psychic influences and spirit photography, and we ought to be grateful to him. So long as we realise that there will be a good deal more blundering round before we know the whole truth, no harm will be done by a good deal of speculative thinking and writing. It is not easy to foresee which facts are going to be useful. Comte, a widely read and philosophical man, in 1842 regretted the time spent by astronomers in studying the fixed stars because nothing could possibly be learnt about them. And now they help us to understand the building up of positive nuclei and negative electrons into the multitude of chemical compounds we are acquainted with. Some day Wilson's Theorem of Prime Numbers may be dragged in! What a lot of trouble would be saved if we could simply look into the inside of the molecules and see what was there.

"Why has not man a microscopic eye?
For this plain reason, man is not a fly."

There are plenty of puzzling features about the analysis of substances by means of their spectra, and the analysis of the various lines in a spectrum by ingenious mathematicians. Dr. Hicks calls attention to one of these puzzles. The wave-length of the various lines in a spectrum seems to involve a function of the atomic weight of the element concerned. The difference between the wave-lengths of the lines composing double lines and triplets is usually a simple function of the atomic weight. According to all modern ideas atomic weights are a mean, a rather haphazard mean, of the weights of the isotopes which make up the element. There is no chlorine atom with a weight of 35·4, this atomic weight is merely a mean between a number of atoms each weighing 35, and a smaller number of other atoms each weighing 37. What is it that gives rise to the ordinary visible spectrum? The Fraunhofer lines seem to be caused by the vibration of something or by a change in the rotation or vibration of something. And

these lines involve some function of the atomic weight, the weight of something which does not seem to exist. The wavelengths of X-ray spectra depend on atomic numbers, not atomic weights. And X-ray spectra seem to merge almost imperceptibly into infra-red spectra. Perhaps this gives a clue to this apparent anomaly.

It was a difficult problem to compare the spectra of the various isotopes of the same element, and the experiments of Russell and Rossi in 1912, Soddy and Hyman in 1914, and other workers in the same year were inconclusive. The separation of isotopes is nearly impossible, and it is only occasionally that a comparison of the spectra of two isotopes can be made. The researches of Aronberg in 1917, Merton in 1920 and 1921, and McLennan in 1922, show that a slight difference in such spectra can be detected and measured.

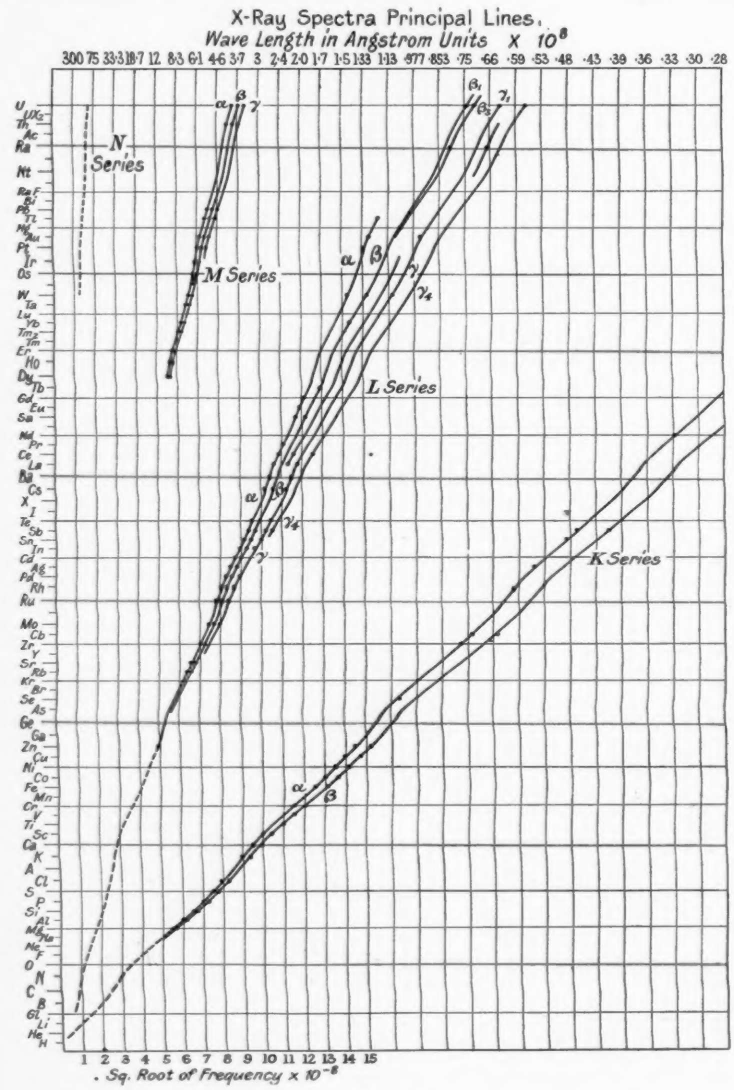


FIG. 3

Professor Bohr has perhaps thrown more light on the meaning of spectra than anyone else, and his researches at Copenhagen require careful consideration. He takes one electron revolving at a fixed distance round a positive nucleus in such a fashion that its normal rotation uses up no energy and gives out no vibrations. From calculations of the kinetic energy of the electron and the conditions fixing stable orbits of rotation, he finds that the radii of the successive stable orbits will be proportional to the squares of consecutive integers. He finally obtained the formula that the frequency of a vibration is of the form $C\left\{\frac{1}{N^2}-\frac{1}{n^2}\right\}$ where N is 1, 2, 3, etc., and n is 2, 3, 4, etc., and C is a constant. This formula is of course identical with the Balmer formula already mentioned. Now he considers that an electron rotating about a hydrogen nucleus may by some shock to the system be driven out of its normal orbit farther away from the nucleus. When it returns to its own orbit it will give out a certain amount of radiation. Figure 2 (taken from a paper by M. Lepape, in the *Bulletin* of the French Chemical Society), shows the possibilities. The circles have radii of lengths 1, 4, 9, 16, 25, and so on, and each of these, according to Bohr, is a stable orbit for an electron. An electron driven by some exciting influence to the circle 5 can roate in that orbit, but will return nearer to the hydrogen nucleus when it gets the opportunity. If it returns to the circle 3 it will lose a certain amount of energy and emit a radiation corresponding to one of the lines in the Ritz-Paschen spectrum. An electron passing from the third orbit to the second will give out the α line of the ordinary hydrogen spectrum. The spectroscope shows the total effect of a large number of such phenomena, those which happen rarely causing only faint lines.

Similar calculations have been made for the helum atomi, and are found to agree with the spectra actually observed.

The same sort of argument is applied to X-ray spectra. (See Figure 3.) We have a K series of lines, an L series, an M series, and probably N, O, P, and Q series, though hardly any measured lines have as yet been found for these last four. Now these series seem each to belong to a ring or sphere of electrons rotating about a central nucleus. The one electron of hydrogen and the two electrons of helium occupy the K shell, the outer electrons of lithium, glucinum, boron, carbon, nitrogen, oxygen, fluorine and neon occupy the L shell, and so on. An electron passing from the L shell to the K shell will give the K_α line of the X-ray spectrum, one passing from the M shell to the K shell will give the K_β line. An electron passing from the M shell to the L shell will give the L_α line of the X-ray spectrum.

A remarkable relationship has been predicted and found to exist by Kossel concerning the frequencies of the lines of the various series of X-rays. It is as follows :—

$$K\beta - K\alpha = L\alpha$$
$$K\gamma - K\beta = L - L\alpha = M\alpha, \text{ etc.}$$

that is to say, for each element the difference between the frequencies of the β line and the α line in the Kseries will equal the frequency of the α line in the L series; the difference between the frequencies of the β line and the α line in the L series will equal the frequency of the α line in the M series, and so on. This relationship is not apparent in the diagram, because this shows, on the bottom scale the square root of the frequency and on the top scale the wavelengths plotted not at equal distances but logarithmically so as to show the actual wavelength drawn to correspond with the square root of the frequency.

Figure 3 is constructed from data given in papers by Hughes, Coster, Siegbahn, Hjalmar and others in the *Philosophical Magazine* in 1919, 1920, 1921 and 1922, and in papers by de Broglie, Dauvillier and others in the *Comptes Rendus* for 1921 and 1922, and in a paper by Stenström in the *Ann. Physik* in 1918. There are many more lines than are shown in the diagram, the data differ in the degree of their accuracy, minute differences have been ignored, and it would require a much larger diagram to show all the data which have been published. Dauvillier, having satisfied himself that the series mentioned above all exist, has classified the electrons for each element and distributed them amongst the concentric shells

which each series requires. It seems to give some such result as this:—

Element.	K	L	M	N	O	P	Q	Element.	K	L	M	N	O	P	Q
H	1							Ti	2	8	8	4			
He	2							V	2	8	8	5			
Li	2	1						Cr	2	8	8	6			
Gl	2	2						Mn	2	8	9	6			
B	2	3						Fe	2	8	10	6			
C	2	4						Co	2	8	11	6			
N	2	5						Ni	2	8	12	6			
O	2	6						Cu	2	8	18		1		
F	2	7						Zn	2	8	18		2		
Ne	2	8						Ga	2	8	18		3		
Na	2	8	1					Ge	2	8	18		4		
Mg	2	8	2					As	2	8	18		5		
Al	2	8	3					Se	2	8	18		6		
Si	2	8	4					Br	2	8	18		7		
P	2	8	5					Kr	2	8	18		8		
S	2	8	6					Rb	2	8	18		8	1	
Cl	2	8	7					Sr	2	8	18		8	2	
A	2	8	8					Y	2	8	18		8	3	
K	2	8	8	1				Zr	2	8	18		8	4	
Ca	2	8	8	2				Nb	2	8	18		8	5	
Sc	2	8	8	3				Mo	2	8	18		8	6	

and so on,

If any reader likes to pursue the details further, the following table gives Dauvillier's scheme in a concise form, hydrogen and helium being omitted :—

Number of External Electrons	K	L	M		N		O		P	Q
1	—	Li	Na	K	Cu	Kb	Ag	Cs	Au	—
2	—	Gl	Mg	Ca	Zn	Sr	Cd	Ba	Hg	Ka
3	—	B	Al	Sc	Ga	Y	M	La etc.	Tl	Ac
4	—	C	Si	Ti	Ge	Zr	Sn	Ce etc.	Pb	Th
5	—	N	P	V	As	Nb	Sb	Ta	Bi	UX_2
6	—	O	S	Cr Mn Fe Co Ni	Se	Mo Ru Rh Pd	Te	W Os Iv Pt	Po	U
7	—	F	Cl		Br		I			
8	—	Ne	A		Kr		X		Nt	

If my interpretation of Dauvillier's scheme is correct, gold will have 2 electrons in the K shell, 8 in the L, 18 in the M,

Hydrogen Spectra on Bohr's Hypothesis

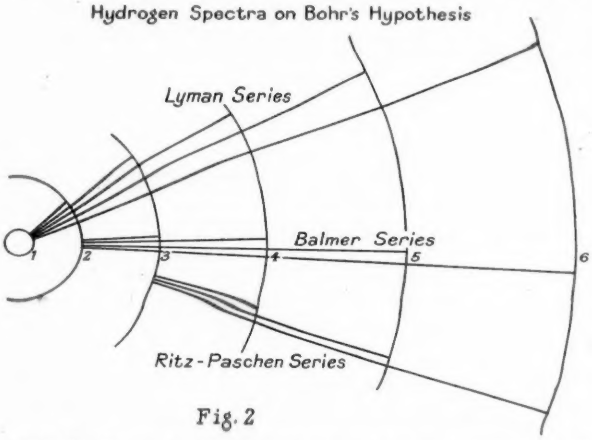


Fig. 2

18 in the N, 32 in the O, and one in the P. Uranium will have this structure :—

K	L	M	N	O	P	Q
2	8	18	18	32	8	6

The scheme of Dauvillier may be compared with other schemes devised by Langmuir. It seems to me the X-ray series are on the whole a safer guide than the Rydberg sum of squares which Langmuir made use of. We really do not quite know enough about valency to construct a perfect classification. Valency is not constant for each element. Does this mean that an electron may in some circumstances be external and in others internal ?

Nobel Industries, Ltd.

Prospects of Constituent Companies

PRESIDING at the third annual general meeting of Nobel Industries, Ltd., held at Winchester House, London, on September 22, Sir Harry McGowan (chairman and managing director) said he thought they might congratulate themselves on the results of the company's trading during the year 1921. There were, he said, many industrial disputes, and the unfortunate coal stoppage, which practically paralysed trade for the time being, and which meant closing down their factories for the manufacture of explosives over a period, cost the company not less than £200,000. That loss, apart from the loss in wages to their workers and the indirect loss to the Empire in many export markets in coal—if only temporary—surely illustrated the suicidal effect of such methods of dealing with industrial disputes. The tendency to lower prices of raw materials during the year, although very hard for industry to bear at the moment, had at least this bright feature for the future, that it assisted them in making a start in the reduction of the selling prices of their blasting explosives and accessories in September, 1921. On no less than four separate occasions during the past twelve months they had made price reductions in various types of explosives, etc., so that this process had now materially affected the whole list.

British Cellulose Co.

Referring to the companies in which Nobel Industries, Ltd., were financially interested, Sir Harry McGowan took an optimistic view of the future of the British Cellulose and Chemical Manufacturing Co., Ltd. Since Mr. Arthur Chamberlain's speech to the shareholders of the Cellulose Co., considerable improvements had been made, and to-day the directors of the Cellulose Co. were so satisfied with the progress made that recently they came to the decision to extend the plant, and if in the near future their expectations as to quality were realised, further extension of the plant would be made forthwith. It now looked as if the company's product would in time compete more actively with the natural product than with other makes of artificial silk, thus enabling them to obtain much better selling prices in a wider field. It had been a long, weary business, and Nobel Industries, Ltd., had been untiring in its efforts to help not only the technical but the commercial management. It was, therefore, satisfactory that the prospects were so much improved as to make the directors of the Cellulose Co. feel confident of the future of the industry.

In addition to the assistance given to the Cellulose Co. they had to give financial backing from time to time. As a consequence of the financial reconstruction, those shareholders in that company who had stood behind them on the footing of a first debenture had had to accept 6 per cent. income bonds for their security, the share of Nobel Industries, Ltd., being £150,000. The expectations formed at that time and since confirmed by actual experience convinced the directors that this step was well worth taking, and they felt that by accepting this second place for their loan they had helped to make good their own investment. Since their last meeting they had not altered their holding of shares in the British Cellulose Co.

British Dyestuffs Corporation

With regard to the British Dyestuffs Corporation, Ltd., continued the chairman, Sir William Alexander, chairman of the Corporation, assured him that the works were now much more efficient than formerly, and that in his opinion when an improvement in the textile industry occurs the company should be working on a profitable basis. The Nobel holding in this company remained unchanged.

Chilean Explosives

Another of their investments was in the Chilean Explosives Co., in which they had taken up 300,000 shares, or 50 per cent. of the capital, the other shareholders being the Du Pont Co., of America, and the Atlas Powder Co., of America. About eighteen months ago, as a result of investigations by a committee appointed by the Du Pont Co. and themselves, Nobel Industries, Ltd., agreed that the time had come to consider the erection of a factory for the manufacture of explosives in Chile. Chile and Bolivia were large consumers of explosives, and with certain of the raw materials used in the manufacture of explosives to be found on the spot and with an expressed desire on the part of the Chilean Government that Chile should be self-contained in this direction, it was decided to erect a factory at a spot convenient for the supply required by the above demands.

The Nature of Acids

To the Editor of THE CHEMICAL AGE.

SIR,—In your issue of 23rd inst., your correspondent "Student" makes appeal to me to explain what he fears are inconsistent definitions of an acid. The two statements, "Acids are those substances which give H-ions in aqueous solutions" and "we shall apply the name of acid proper only to such compounds as are derived from aldehydes by the simple addition of oxygen" are not contradictory, but are made, the former as a definition of an acid, the latter as a classificatory statement regarding the constitution of substances which possess acid properties—*i.e.*, which give H-ions in aqueous solutions. The introduction of oxygen into acid is well known to increase the acid properties—*i.e.*, to increase the degree of ionisation of the substance.—Yours, etc.,

ALEX. FINDLAY.

University of Aberdeen,
September 26, 1922.

To the Editor of THE CHEMICAL AGE.

SIR,—The characteristic reactions of all acids are due to the presence of the H-ion into which the acids split when in aqueous solution and not to the presence of oxygen, since hydrochloric acid, HCl, which does not contain this element, is a physically strong acid.

The acidic character of such hydrogen compounds really depends in the first place upon the condition of the remaining portion of the molecule other than the acidic hydrogen —*i.e.*, on the electronegative character of this portion. In hydrochloric acid for instance; HCl, Cl is strongly electronegative and the compound behaves as a strong acid, while on the other hand in sulphuretted hydrogen, H_2S, the sulphur being weakly electronegative, confers weak acidity to the compound.

The acidic character of hydrogen in oxy-acids is again due to the presence of negative groups—*e.g.*, the constitutional formula for sulphuric acid is $SO_2\begin{cases}OH\\OH\end{cases}$ and the acidity is therefore due to the influence of the negative group $>SO_2$, similarly in the organic acids proper which always contain the carboxyl group COOH, the acid character is ascribed to the negative carbonyl group $>CO$, with the result that a H-ion is split off, thus acetic acid ionises in this way $CH_3, COOH = H^+ + CH_3COO^1$.

Incidentally, if hydroxyl is combined with an electro *positive* group such as a metal atom, it ionises as such and the compound is basic, thus—

(1) $KOH = K^+ + OH^1$ and not (2) $KOH = KO^1 + H^+$.

It is this electro-chemical character of the rest of the molecule which determines whether and to what extent the H-ions are split off, and it is actually found that the "strengths" of acids are in the order of their H-ion-concentration.

It was an old and erroneous belief, supported at first by Lavoisier, that all acids contained oxygen, and hence the element was regarded as the acidifying principle, the name being derived from the Greek word meaning "acid."

Again, Moureu does not mean to say that the oxygen is the cause of acidity of an organic acid, but I imagine that this is his way of saying that all organic acids proper contain the COOH group, since it is a general reaction that all aldehydes, R.CHO, are oxidised to acids, R.COOH, by the addition of one atom of oxygen.

"QUALIFIED CHEMIST."

September 26, 1922.

The Problem of Solution

To the Editor of THE CHEMICAL AGE.

SIR,—Professor Lowry and some others of your readers seem to have readily penetrated the thin disguises of *The Compleat Chymist* and its author. He must know that in trying to express current ideas in language with only a small concentration of technical terms, I am stretching my meagre acquaintance with the subject to its utmost extent, and that I am incapable of making any addition to the knowledge already in existence.

It seems to me that Lewis's Octet theory has an idea of truth in it, although I do not think we have as yet an accurate method of expressing it. The experiments of Aston, Bragg, and Rutherford, and the speculations of Bohr, Dauvillier, and Langmuir are rapidly tending to a further stage in explaining the nature of solution. In five or ten years we may have a tolerable foundation on which to build, and it appears to me to be a pity in the interim to write, as some do, very confidently of the independent existence of ions, and to teach young students to think and to write in terms which may quite easily require great modification in a short space of time. The assumptions that dissociated ions exist in dilute solutions, that electrical conductivity tends to a limiting value in infinitely dilute solutions, and that the ratio between the actual conductivity and this theoretical limit will give you the ratio between the numbers of the dissociated and the total molecules seem to me to be perfectly proper assumptions. They do not appear to me to be proved or probable, but my opinion on this is of no importance.

The point that interests me is that there must be many other curious people who merely wish to know the truth about this and other matters. If an ionic dialect or jargon helped me to find out what a writer meant, I would cheerfully put up with it. In my case it makes that darker which is dark enough without, and I am inclined to think it has that effect on most of the writers who adopt this phraseology. A friend, whose opinion I value, in criticising my dialogue, says the ionic hypothesis "is generally accepted with certain mental reservations as to the existence of ions." It is the use of a special phraseology which makes it easy for writer and reader to make mental reservations.

In my youth I was told that potassium and chlorine combined to form molecules of potassium chloride. Now A tells me that potassium and chlorine don't combine together at all, B tells me that in crystals, at any rate, molecules of potassium chloride do not exist, C and D, etc., down to K, tell me that potassium chloride does not exist in dilute solutions, L tells me that potassium and chlorine combine to form two independent ions of potassium and chlorine, and so on down to Z, who tells me he accepts the ionic hypothesis with certain mental reservations as to the existence of ions. Some of the writers on solution who cannot make up their minds whether they do or do not believe in the dissociation of molecules in dilute solutions, think they escape the dilemma by saying they prefer to speak of ionisation.

Now if it is hard for me, who know but little of the subject and whose mind is fairly vacant, to understand what these people really mean, think how much harder if is for a young fellow who for some years has been trained to read through spectacles specially coloured by the ionists. I sometimes think that there is some truth in the old jibe that when the scientific man is in a quandary he fetches out his Greek lexicon.—Yours, etc.,

B. LAGUEUR.

September 23, 1922.

CO_2, CO and O Recorders

To the Editor of THE CHEMICAL AGE.

SIR,—In his paper before the Engineering Section of the British Association, Engineer-Commander Fraser Shaw (Chief Engineer of the Fuel Research Station, Greenwich) made some very interesting comments on CO_2 recorders.

He pointed out that a CO_2 record alone does not show the true state of combustion, and that the CO or O must be known in addition. That is clear enough. Where there are three factors, two must be known before the whole is clear. But snap tests for CO or O are of very little value. They must be recorded in the same way as the CO_2 is recorded by continuous control. My firm has been working on this problem for some time, and we have brought out the "Arkon" combined CO_2 and O recorder for this very purpose. This instrument is a twin recorder with separate analysis and two charts, but drawing its gas from a single pipe. Caustic potash is used for the absorption of the CO_2 and stick phosphorus for the O.

Now as to CO. It is my firm opinion that the fear of CO is very largely groundless. I would almost say that our industrial boiler plants would be none the worse for a little CO in the flue gas. Most boiler plants up and down the country stand in no danger of it.

The proportion of boiler plants which have CO_2 recorders (or indicators) installed is probably between 10 per cent. and 20 per cent. The 80 per cent. to 90 per cent. of plants *without* CO_2 recorders are not in any danger of having the wasteful CO in the flue gases. Of the former, the only plants in danger are those which have been tuned up to a very high pitch with CO_2 recorders constantly in use, and with a restricted air supply. Further, of these cases CO is possible only on plants steaming with easy load. A demand for "more steam" chases all CO out of the flue gases. Some boiler furnaces, of course, are structurally defective, and cannot complete the combustion properly. That is a fundamental condition, and not an operating condition. In fact, no steam user need be disturbed by the fear of CO in flue gases. We are not really near to it yet. Our boiler plants will be working much more efficiently when we are.

In CO recording there are many difficulties in the way. The absorption in cuprous chloride (as used in the Orsat test) is too slow for an automatic recorder, so that recourse is made to burning the CO to CO_2 either by means of an electrically heated wire or by a tube of copper oxide heated by a bunsen burner. There are, in addition, difficulties in the way of volumetric measurement. The net result is that only one CO recorder, the "Mono" recorder of Sweden, has found its way on to the market as yet. But, as I have said above, the average boiler plant will not yield any CO, and when it does yield it, steps are taken to stop it at once. Therefore when a CO recorder is installed on a properly worked boiler plant it shows nothing on its chart! That is quite sound for the economics of boiler plants, but psychologically it is rather deadening. On the other hand, the oxygen content will usually be round about 6 per cent., which is quite a measurable quantity, clearly shown on the chart. And as the root of all combustion troubles is excess air, this recorder puts another check on it.

A particular application of the combined CO_2 and O recorder which may interest some of your readers is the case of boiler or furnace firing with blast furnace gas. As there is already some CO_2 in the unburnt gas, the final CO_2 alone is not a proper guide to the combustion, and a second check is necessary. This is furnished by the oxygen part of the twin recorder. Another case is kiln firing. The CO_2 record alone is misleading because of CO_2 escaping from the material being dried. In this case also the combined CO_2 and O recorder gives a real check.—Yours, etc.,

W. W. CROSWELLER, A.M.I.Mech.E.

265, Strand, London, W.C.2.
September 26, 1922.

An Appeal to British Chemists

To the Editor of THE CHEMICAL AGE.

SIR,—In September of last year, in consequence of the information received as to the deplorable conditions under which Russian men of science were placed, I issued an appeal to the Fellows of the Chemical Society to assist in the alleviation of the acute distress prevailing amongst their colleagues in Russia.

I have to announce with great satisfaction that in response to this appeal the sum of £214 2s. 7d. was received, besides numerous valuable parcels of clothing, underclothing, boots and books. Of this sum £170 has been devoted to the purchase of clothing, which has been distributed amongst our colleagues in Ekaterinburg, Moscow and Petrograd. In addition to this, three cases containing clothing and books have been despatched to Moscow and Petrograd.

The difficulty with which we were confronted—namely, the uncertainty as to whether parcels sent from England would reach their proper destinations—has now happily been overcome, definite proof having been received in every case that the goods have reached those for whom they were intended.

In a letter written by one of the workers of the European Student Relief Society to the Friends' Relief Committee, the following passage occurs:—

"The Chemical Society in England recently sent out some scientific journals, etc., through the Friends. They have been entrusted to me for distribution, and when I told some of the Moscow professors of their arrival, their eagerness to see them was like the eagerness of the children in the famine areas to get bread. You can assure all donors that every journal would be properly circulated in the faculty concerned and be retained in the library."

It will be seen from this how urgent the need still is for scientific books; and, from information received from the Committee of Russian Men of Science (a member of which visited this country last spring), the need for every kind of scientific apparatus appears to be equally pressing.

Notwithstanding the useful work that has been accomplished by the different organisations formed to relieve the wants of men of science in Russia, there remains much to be done, for there is every reason to fear that the necessity will be no less acute during the coming winter than it was last year. I therefore issue this appeal to Fellows of the Chemical Society and to British chemists generally to render every assistance within their power, in the confident hope that a generous response will be forthcoming.

In addition to donations of money to be devoted to purchasing requisite articles, gifts of clothing (which, if used, must be in good condition), and recent chemical literature, will be welcome. The Chemical Society will continue to act as the receiving depôt, and cheques (made payable to Mr. S. E. Carr, and crossed "Russian Fund"), together with parcels of clothing, boots, books, etc., should be addressed to the Assistant Secretary, The Chemical Society, Burlington House, Piccadilly, W.1.—

Yours, etc.

JAMES WALKER,
President, the Chemical Society.

Burlington House, Piccadilly, London, W.1.
September 28, 1922.

Safeguarding of Industries Act: Part I

Alleged Improper Exclusion of Gallic Acid from Board of Trade List

On Tuesday, September 26, the Referee appointed under Part I of the Safeguarding of Industries Act to consider complaints with regard to the inclusion in or exclusion from the list of articles chargeable with duty, sat to consider a complaint that gallic acid has been improperly excluded from the list. The complaint was lodged by Mr. J. L. Rose, a chemical manufacturer, of Abbey Road, Barking. The complainant is a member of the Association of British Chemical Manufacturers, and was represented by Mr. W. J. U. Woolcock, M.P. (General Manager of the Association).

The Referee pointed out that the complainant should have been represented either by himself, an employee, or a properly instructed solicitor or barrister. Had he known the circumstances 48 hours' previously, he would not have allowed it, but as the parties had appeared, he would hear the case. He made it clear, however, that this was not to be regarded as a precedent.

Mr. Woolcock said he understood that a member of an Association could be represented by an official of that Association. Opening the case for the complainant, Mr. Woolcock said that gallic acid, $C_6H_2CO\ OH\ (OH_3)$, was prepared from gall-nuts, which were excrescences formed on oak trees. They resulted from the puncturing of the oak by an insect, which laid eggs there, and the tree, in endeavouring to deal with the parasite which had come, formed this kind of excrescence. They were round knobs, about the size of an oak apple.

In submitting that gallic acid is a fine chemical, Mr. Woolcock said that its use has been practically discontinued as a pharmaceutical chemical. The General Medical Council had dropped it from the British Pharmacopœia. His recollection was that it was included in the 1885 edition of the B.P., but nowadays, owing to the fact that it does not combine with a protein, its use for astringent purposes is practically *nil*. As to the raw materials for making gallic acid, several methods of manufacture were described in various text books, but he submitted that, in fact, gallic acid is produced from gall-nuts, and nothing else. Continuing, he said that the plant used was very much the same as that used for making azo dyes; he supposed that there was no doubt that azo dyes were fine chemicals.

The Referee said he had not considered that.

Mr. Woolcock suggested that dyes were nothing more than fine chemicals coloured. There was nothing very special about the plant except its small size, and it could be used for making various fine chemicals. Skilled supervision was necessary, and in Mr. Rose's works a sample was brought down to the laboratory for inspection at every stage of the process, and the manufacture had to be carefully watched.

A B.C.M. Grouping System

The complainant was a member of the Fine Chemical Group of the Association of British Chemical Manufacturers—Group 6. The grouping of the members had been mentioned in previous cases which had been considered by the Referee, and there had been some misunderstanding. Mr. Woolcock produced a copy of the Memorandum of Association, which set out the various groups of the Association. To the term "Fine Chemicals" there were added sub-divisions of fine chemicals, such as analytical chemicals, pharmaceutical, and so forth. These sub-divisions were not intended to define fine chemicals, but were simply explanatory, and did not cover all the various groups of fine chemicals. The object of adding the sub-divisions was merely to give examples, and not to define fine chemicals, as had previously been considered to be the case.

As to the uses of gallic acid, continued Mr. Woolcock, the substance was used mainly for dyes and for making pyrogallic acid.

The Referee asked whether pyrogallic acid was included in the Board of Trade list of articles as a fine chemical.

Mr. Ronca (of the Board of Trade) replied that it was, and also as a synthetic organic chemical.

Mr. Woolcock said that when the Dyestuffs Act was being considered, and the schedule of intermediates in that Act, it was a point for discussion whether gallic acid should be considered as an intermediate, or as a fine chemical later on. The very best opinion was obtained on the matter, and it was argued thoroughly, and ultimately the Board of Trade deliberately left it out of the schedule of intermediates to the Dyestuffs Act, holding that it was a fine chemical.

Mr. Ronca said it was put in the list under the Safeguarding of Industries Act originally as a fine chemical, and not as an intermediate product. Later it was taken out. He was pressed to put it in the schedule to the Dyestuffs Act as an intermediate product, but had decided that it was not an intermediate, because it was held that an intermediate was an intermediate between a coal tar distillate and the finished dye. At that time the Safeguarding of Industries Act was not under consideration.

The Referee said it must have been decided to be in one Act or the other.

Mr. Woolcock: Yes, that is my point.

Purity of Gallic Acid

Questioned by the Referee as to the degree of purity of gallic acid, Mr. Rose (the complainant), said it was about 99·8 per cent.

Mr. Ronca suggested that that was a very high standard for a product of that type.

Asked for evidence as to how gallic acid had been treated by the chemical trade, Mr. Rose said that he had been making it since the beginning of the war. He had sold it to Charles Zimmerman and Co., and R. W. Greeff and Co., chemical merchants, which firms had two departments, one for heavy and one for fine chemicals. He had always dealt with the fine chemical department of Messrs. Greeff so far as gallic acid was concerned. He could not very well ask them to come and give evidence, because, in general, merchants were rather opposed to the Act.

A list of fine chemicals, issued by Charles Page and Co., Ltd., chemical merchants, in July of this year, was then handed in, which included gallic acid. The Referee pointed out, however, that he wanted evidence as to trade usage before the passing of the Act, and that, had the price list been issued in 1919 or 1920, it would have been very helpful. As to trade journals, Mr. Rose said that the substance did not appear very much in these, because the quantities used were so small.

Mr. Ronca then dealt with the position of the Board of Trade. He accepted substantially all that had been said. When the Board of Trade prepared the lists, the first thing they did was to decide whether a substance was a fine or a heavy chemical. They did not apply indeterminate tests to each particular article. In certain cases, however, there was some doubt, and they had to apply what might be called secondary tests. They quite realised that if they went to the trade they would get completely divergent opinions as to trade usage. So far as gallic acid was concerned, they never dreamed of applying secondary tests. They regarded this substance as a commercial product, and had no doubt in their own minds that it was a fine chemical. On the other hand, when Section 1 (5) of the Act (which provides for complaints being referred to the Referee) became well known, the Board received a number of challenges, one of which concerned gallic acid. The fact that the challenge was received was itself evidence that the trade was expressing diverse opinions. The Board knew that if they gave way to people who said that gallic acid was not a fine chemical, others would challenge them and say that it was a fine chemical, and they had no option but to apply secondary tests. The answer to those tests in every case was that gallic acid was not a fine chemical.

Mr. Woolcock then suggested that the Board of Trade had entirely misconstrued the Referee's decision with regard to tartaric acid, cream of tartar and citric acid, and had interpreted that to mean that all chemicals used in industry were heavy chemicals.

The Referee said that in that decision he had remarked that the trade regarded heavy chemicals as commercial products mainly used for industrial purposes, and he was satisfied, so far as trade usage was concerned, that the com-

plainants had proved that not one of those three substances had been properly regarded as a fine chemical. But here they had quite a curious case, in which an industrial chemical was used in quite small quantities.

Mr. Ronca said the Board did not accept that an industrial chemical is generally used in large quantities.

Mr. Woolcock said that if the Board of Trade were right in their interpretation, no undoubtedly fine chemical which was used in industry in making another chemical could be a fine chemical, because it was used for industrial purposes.

The Referee said he had never intended his remarks in the previous case as a definition. He still believed that, in substance, the trade was guided in that if a thing had a big industrial use it was classified as a heavy chemical. All he meant was that the great bulk of the trade probably did regard heavy chemicals as chemicals used in large quantities mainly for industrial purposes; that was rather different from saying that he was laying that down as a definition.

Mr. Ronca then drew attention to a number of passages in the decision referred to, all tending to the view that the Referee was using as a test the determination as to whether or not the substances under consideration were used mainly for industrial or technical purposes.

The Referee said that that was one of the things to which one must attach considerable weight. He then referred to the grouping of the members of the A.B.C.M., pointing out that the wording was one of the points relied upon by the fine chemical people. He asked whether there was any word in the sub-divisions to Group 6 which covered gallic acid.

Mr. Woolcock said there was not, but there were many other fine chemicals which would not be covered. He suggested it was a good test to see to which groups the Council of the Association allocated its members.

The Referee said that previous evidence had been that a member could enter any group he liked.

Mr. Woolcock replied that that was not so, but that the Council of the Association decided. For instance, Mr. Rose made pyrogallic acid, which was admittedly a fine chemical, and he was in Group 6. He was previously in Group 9, because at that time it was considered that gallic acid might be an intermediate, but when it was decided that it was a fine chemical he was put into Group 6.

Asked what percentage of his gallic acid was used for making pyrogallic acid, Mr. Rose said that this varied in accordance with trade. If the dye makers were busy, then they would require more gallic acid than if they were slack, and less would be used for pyrogallic acid.

Mr. Rose said he would not have brought this complaint had he not ascertained from the merchants that they regarded it as a fine chemical. He would have considered it futile.

The Referee said he must have evidence to show how the trade regarded gallic acid before the passing of the Act.

Mr. Woolcock said there were no trade witnesses present to say that it was not regarded as a fine chemical.

Trade Usage

The Referee pointed out that there were no witnesses to say that it was. A copy of Mr. C. A. Hill's paper, read before the Society of Chemical Industry in 1916, on the manufacture of fine chemicals, was produced. This included gallic acid, and the Referee regarded it as a definite piece of evidence of considerable weight. He was not prepared to come to any conclusion, however, until he had been given direct evidence, and he reminded the complainant that a person raising objections to the list had to show that what had been done was wrong, and he did not think evidence to that effect had been given. The complainant must prove that something wrong had been done. The first thing to do was to come to a conclusion as to trade usage, and the production of catalogues and trade journals would be helpful. Mr. Ronca had suggested to him that he might have formed the impression, by previous remarks, that he did not want trade journals produced any more. He did not know why, and did not think he had ever said a word to indicate that he did not regard the reasonable production of trade journals as very helpful. He did not feel inclined to decide a case, in which there was a difference of opinion, on insufficient material, and did not see why there should not be something more available. For instance, if Messrs. Charles Page's catalogue had been issued two years earlier, it would have been almost enough to settle the case.

Mr. Ronca said he felt that gallic acid was used to such a small extent that it would be difficult to get such evidence. Except for the experience of the last eight months, he would not have imagined any chemist regarding it as anything but a fine chemical.

The Referee said that if one were driven to the conclusion that there had been no trade usage, and, therefore, one had to apply different tests, it might very well be that it would have to stay where it was. They would have to consider the quantities produced, its purity, etc. He did not think very much about the difficulty of production, because he had been told many times that there was enormous supervision required to produce some heavy chemicals. He was impressed by the fact that gallic acid was very closely allied to pyrogallic acid, which was conceded a fine chemical. One could not see why one should be a fine chemical and the other not. It was mentioned in Mr. Hill's paper as a fine chemical, Messrs. Page evidently regarded it as a fine chemical, and then there was the statement by Mr. Rose as to Messrs. Greeff.

Replying to questions put by the Referee, Mr. Rose said he had bought a small merchanting business in 1905, and at the end of 1913 he had taken his premises at Barking. He was looking round for something to manufacture when the war broke out, and he decided to manufacture gallic and pyrogallic acid. Before 1913 all gallic acid was imported. Before 1920, if he wanted to see price quotations with regard to gallic acid, he would, by instinct, have turned to fine chemical catalogues.

Mr. Woolcock produced a directory published by S. Davis and Co., London, and edited by Mr. C. J. Goodwin, entitled "Where to Buy," in order to show that gallic acid was treated as a fine chemical.

Use as a Fine Chemical

Mr. C. A. Hill (Managing Director, British Drug Houses, Ltd.) then gave evidence in support of the complaint. He said he had always regarded gallic acid as a fine chemical, and had known it as such for 25 years. He had been accustomed to see it in pre-war lists, and had never heard it spoken of as a heavy chemical. He would be surprised to find it amongst heavy chemicals. As an example of the use of gallic as a fine chemical, he said that in the early days of the war there was a rush for gallic acid for use in connection with blue prints.

Copies of the *Journal* of the Society of Chemical Industry, dating back to 1895, were then produced in order to show that gallic acid had been treated as a fine chemical.

This completed the hearing. The Referee said that there must be no mistake in future that on the question of trade usage each case stands or falls, and on that point evidence must always be given. Mr. Ronca's own view was that his first classification was right. He (the Referee) had enough evidence to decide for the complainant, while there was no evidence the other way.

The considered decision of the Referee will be given in due course.

With regard to the position of the merchants in this case, we are informed by the Chemical and Dyestuff Traders' Association that they did not receive an intimation of the actual date on which the case would be heard until it was too late for them to lodge a complaint. They have therefore informed the Board of Trade that they will ask for a re-hearing of the case if gallic acid is restored to the Board of Trade's list.

Contracts Open

Tenders are invited for the following articles. The latest dates for receiving tenders are, when available, given in parentheses:

Australia (October 11).—Sodium acetate (5 tons). Particulars from Department of Overseas Trade (Room 53), 35, Old Queen Street, London, S.W.1. (Reference No., D.O.T. 9320/E.D./C.P.)

Egypt (October 2).—Tieröl (about 3,000 litres). Particulars from Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference No., D.O.T. 8759/F.E.)

Lambeth (October 13).—Portland cement (7,500 casks of 400 lb. each). Particulars from Director-General, India Store Dept., Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

Salford.—Salt. Particulars from the Superintendent, Wilburn Street Depot, Salford.

August Trade Returns

£200,000 Improvement in Chemical Exports

According to the Board of Trade Returns for August the exports of chemicals, drugs, dyes and colours, valued at £1,662,609, were £217,966 more than in the preceding month, while imports, at £1,125,021, indicate an increase of £293,045. As compared with August 1921 the export total for the month under review is £491,368 more, and imports are £364,124 more. Although comparison with the corresponding figures for 1920 is somewhat invidious, owing to the tremendous fall in the prices of most commodities, it is interesting to note that the present month's exports are £1,552,105 below the 1920 total and the imports are £2,131,991 below.

Imports of Chemicals

A comparison between quantities imported in August and July of this year respectively indicates all round increases, the most striking of which will be noted under sodium nitrate, borax, and potassium compounds. The only visible decreases appear under tartaric acid, crude glycerin, and cream of tartar.

The detailed import figures, in cwts., unless otherwise stated, are given below with the July figures in parentheses. Increases: Acetic acid, including acetic anhydride, 507 tons (371); bleaching materials, 3,410 (2,117); borax, 7,399 (3,299); calcium carbide, 21,421 (20,648); distilled glycerin, 361 (239); red lead and orange lead, 2,206 (1,944); potassium nitrate, 16,147 (11,642); potassium compounds other than nitrate, 195,248 (124,602); sodium nitrate, 128,681 (42,464); sodium compounds other than nitrate, 19,034 (10,825); and zinc oxide, 502 tons (465). Decreases: Tartaric acid, including tartrates not elsewhere specified, 5,707 (5,788); crude glycerin, 3,485 (4,739); and cream of tartar, 3,736 (4,124.)

Recovery in Sulphate of Ammonia

A feature of the export side is the improvement in sulphate of ammonia shipments, the total for the month under review being very nearly twice as large as that for the preceding month. Of the August total of 14,649 tons, of the declared value of £236,360, all the usual consumers took more, with the exception of the Dutch East Indies. Spain and the Canaries took 4,587 tons; France came next with 2,933 tons, and was followed by the British West India Islands and British Guiana with 2,026 tons; the Dutch East Indies, with 1,959 tons; Japan with 204 tons; and Italy with 170 tons; other countries, which are not enumerated, took 2,770 tons.

The United States continue to increase their purchases of bleaching powder from this country although the total exports of this commodity are less than half those of the preceding month. In addition to bleaching powder there were big drops in shipments of copper sulphate, sodium sulphate, tar oil, creosote, benzol and toluol. Beyond one or two other small decreases the remaining products showed fairly satisfactory increases.

The following figures show in detail the products the August exports of which were larger (as to quantity) than in the preceding month; the July figures are given in parentheses, and the figures represent cwts., unless otherwise stated :—Sulphuric acid, 1,377 (1,278); tartaric acid, including tartrates not elsewhere specified, 321 (278); ammonia chloride (muriate), 444 tons (437); sulphate of ammonia, 14,649 tons (7,387); anthracene, 47 (nil); carbolic acid, 19,091 (6,130); naphthalene, 2,758 (1,516); distilled, glycerin, 8,927 (3,180), potassium chromate and bichromate, 2,103 (2,042); potassium compounds other than nitrate, chromate and bichromate, 1,988 (1,866); sodium caustic 134,816 (126,107); sodium chromate and bichromate, 5,331 (3,630); sodium compounds not elsewhere specified, 58,714 (36,027); and zinc oxide, 332 tons (318).

The decreases, similarly compared, are: Bleaching powder, 10,713 (26,811); benzol and toluol, 658 gallons (8,557); naphtha, 2,084 gallons (2,709); tar oil, creosote, etc., 2,076,635 gallons (2,607,337); coal tar products, other sorts, 23,844 (24,889); copper sulphate, 869 tons (1,316); crude glycerin, 1,336 (2,325); potassium nitrate, British prepared, 1,155 (1,200); sodium carbonate, including soda crystals, soda ash and bicarbonate, 311,739 (328,377); and sodium sulphate, including saltcake, 35,495 (119,610).

Dyes and Dyestuffs

There was a considerable increase in the importation of dyes and dyestuffs during the month, particularly under alizarine and cutch. The year's total import of 1 cwt. of coal tar intermediates (including aniline oil and salt and phenylglycine) has been trebled in the month under review by an importation of 2 cwt., of the recorded value of £27. Natural indigo was the only dyestuff which showed a decrease on the previous month's figures. The total quantity of finished coal tar dyestuffs imported during August was 3,776 cwt., valued at £94,666; the imports in July totalled 2,719 cwt., of the value of £85,271. The totals for August of 1921 and 1920 were respectively 5,527 cwt. and 28,808 cwt.

The comparative figures for August and July this year are: Coal tar intermediates, 2 (nil); alizarine, 522 (152); finished coal tar dyestuffs other than alizarine and synthetic indigo, 3,252 (2,567); cutch, 6,389 (2,308); extracts for dyeing, other sorts, 9,265 (6,660); natural indigo, 117 (196); extracts for tanning, solid or liquid, 82,002 (72,786).

Exports of dyes and dyestuffs were 798 cwt. less than in July. The total of 6,965 cwt. (as against 7,763 in July), made up of 2,868 cwt. of coal tar products (as against 3,668), and 4,097 cwt. of other sorts (as against 4,095), was valued at £54,463, while the previous month's exports amounted in value to £68,202.

Painters' Colours and Materials

Imports of painters' colours and materials, with the exception of ground barytes, were lower, while exports were 20,793 cwt. short of the July total. The comparative figures are: Imports: Ground barytes (including blanc fixe), 70,909 (40,218); white lead (basic carbonate), 8,496 (12,405); painters' colours and materials, other sorts, 59,496 (63,058). Exports: Ground barytes (including blanc fixe), 3,835 (12,334); white lead, 20,669 (19,997); paints and colours ground in oil or water, 16,526 (22,054); paints and enamels prepared (including ready mixed), 18,199 (18,124); painters' colours and materials, other sorts, 39,142 (46,565).

Scientific Instruments and Glassware

Scientific glassware (except tubing and rod), was imported to the value of £5,118, as compared with £4,096 in July, while 333 cwt. of glass tubing and rod, valued at £1,154, were imported as against 324 cwt. of the value of £1,148, imported in the preceding month. Exports of tubing and rod totalled 571 cwt., worth £323, as against 60 cwt. of the value of £414, shipped in July. Exports of scientific glassware other than tubing and rod amounted in value to £4,834, as compared with £4,343. We imported 111,666 gross of glass bottles and jars as against 102,724 gross, and exported 33,993 gross as compared with 28,520 gross.

Scientific instruments and appliances (except electrical) were imported to the value of £38,357, against £34,381, while the exports under this heading totalled £66,294 as compared with £69,908.

Hearth Gases from Blast Furnaces

In the course of the study of hearth gases from blast furnaces, being made by G. St. J. Perrott, physical organic chemist of the U.S.A. Bureau of Mines, at the southern experimental station, Birmingham, Alabama, the results of sampling hearth gases of four blast furnaces have so far shown no difference in the combustibility of different cokes in the hearth of the blast furnace. There is a difference in the rate of reaction of different kinds of coke with carbon dioxide at a temperature of 1000° C. These results are corroborating the combustion experiments that are being carried on by John Blizard, fuel engineer, in the Kreisinger furnace. The suggestion has been offered that combustibility tests be made in a small furnace at the lowest possible rate at which combustion may be maintained in order to determine if there is a different influence of the various kinds of coke on the rate of combustion at low temperatures. It may be that combustibility of coke in the blast furnace is significant not at the hearth but while up in the furnace where the temperatures are much lower. This problem will have to be attacked by getting gas samples higher up in the furnace. It is hoped to make an arrangement with a blast furnace operator to take samples higher up on the bosh. It has been suggested that special bosh plates be made with openings for gas sampling tubes. It is hoped to find some blast furnace operator who will co-operate in using such special bosh plates.

The Institute of Metals

Papers Read at Swansea Meeting

AT the autumn meeting of the Institute of Metals held last week at Swansea, Dr. GUY D. BENGOUGH and Mr. J. M. STUART presented the Sixth Report to the Corrosion Research Committee of the Institute of Metals on the Nature of Corrosive Action, and the Function of Colloids in Corrosion.

This report attempts to present a general discussion of corrosion phenomena, based on the study of several different metals, and to examine how far the electro-chemical theory of corrosion (usually called the electrolytic theory) can account for the observed phenomena. The difficulties encountered by this theory are indicated, and it is shown that it gives a satisfactory account of the facts only under certain conditions, while many facts can only be explained by recognising the important part played by colloids in corrosion. A theory of the mechanism of colloid action is put forward, and some experimental results are reviewed in the light of this theory.

Definition of Terms

The report defines the terms corrosion, chemical exfoliation, erosion, and scale, which are used somewhat loosely by some writers. Corrosion is defined in its widest sense as the oxidation of a substance. It is then pointed out that such oxidation may be produced by chemical or electro-chemical means, and these two types of reaction are defined. Chemical reactions may occur when the reacting bodies are in contact, electro-chemical reactions when the reacting bodies are spatially separated. In the latter case the reacting substances must be capable of ionisation, and a portion of the energy of the system appears as electrical energy. Two cases of corrosion are considered, both of which can be carried out chemically or electro-chemically. Pure electro-chemical action may in certain cases be relatively unimportant. Thus the cathode of a cell of high voltage may be more rapidly attacked than the anode, while an anode at a high voltage tending to force it into solution may be very little corroded, owing to scale formation.

Further facts which are difficult to explain on a purely electro-chemical theory are the following:—(1) Certain depolarisers do not increase corrosion, but actually inhibit it. (2) The conductivity of electrolytes is not directly connected with the amount of corrosion. (3) Lambert's pure iron (probably the purest metal ever produced) was found to be readily attacked by sodium chloride solution and dilute acids. (4) According to the electro-chemical theory, the presence of ions of the corroding metal should depress the corrosion of most of the common metals. There are, however, numerous exceptions, and in some cases the presence of such ions actually increases corrosion.

The order of corrodibility of metals in distilled water, certain salt solutions, and non-electrolytes is different from their order in the electro-chemical list, which suggests that there are factors interfering with the electro-chemical action. Such a factor is scale formation, and a main factor in determining the amount of corrosion by water and salt solutions is the nature and distribution of the products of corrosion. This may be far more important than any hypothetical distribution of cathodes and anodes in the metal. The effects of strain and impurity in the metal are considered on the electro-chemical view to be of fundamental importance, and Lambert's pure iron and lead were prepared with a view to eliminating both these factors. Neither metal was incorrodible in certain conditions. However, potential differences between strained and unstrained portions of the same metal are usually very small, and unstrained (annealed) metal may corrode more rapidly than strained metal. In fact, the effect of strain is a minor and ephemeral factor in corrosion in neutral solutions.

Role of Colloids in Corrosion

A theory is developed regarding the part played by colloids in corrosion, and this theory may be briefly outlined as follows:—A metal immersed in water sends positively charged metal ions into the liquid, and becomes itself negatively charged. In the case of ordinary commercial metals, the metal also becomes superficially oxidised if dissolved oxygen is present. The hydroxide produced by this oxidation can take up the ions given off by the metal, and the hydroxide thereby passes into the state of a positively charged colloid. Some of this colloid will diffuse away, permitting further reaction between the oxygen and the metal surface, and thereby re-forming the hydroxide film over the latter. Oxidation is then stopped till this hydroxide can pass into the colloidal state by acquiring positively charged metal ions. This, in general, does not take place till the colloid initially formed has diffused into the presence of electrolyte, when it is precipitated by the anion of the dissolved salt, the cation neutralising the charge on the metal corresponding to that on the colloid. This allows the metal to send more ions into solution, and the uncharged hydroxide thereby acquires a charge. If the colloid so produced can diffuse away, the process can continue and corrosion develop.

Determination of Aluminium

A report to the Aluminium Corrosion Research Sub-Committee of the Corrosion Research Committee of the Institute of Metals on "Experiments on the Oxide Method of Determining Aluminium," by J. E. CLENNELL, B.Sc., was also presented.

The object of the investigation was to find a direct method of determining aluminium in presence of iron and other impurities. The phosphate method was rejected as it had been found that the precipitates obtained showed varying proportions of alumina and phosphoric acid. The ammonia method of precipitating aluminium as hydroxide was likewise rejected owing to the difficulties of filtering and washing the precipitate and obtaining it free from impurities.

Experiments were made on the methods described by previous investigators, in which aluminium is precipitated as hydroxide by alkali nitrites, by phenyl-hydrazine and by a mixture of iodode and iodate of potassium, but more satisfactory results were obtained by precipitation with alkali thiosulphates. It was found in nearly all cases that the weight of precipitate exceeded the theoretical amount calculated from the aluminium known to be present. This excess was traced to the presence of small quantities of absorbed substances, notably salts of iron and sulphates, probably of aluminium, which could not be removed by prolonged washing. Substitution of ammonium thiosulphate for the usually employed sodium salt did not reduce the excess.

A method was finally evolved whereby iron was practically eliminated and other impurities reduced to a minimum. This consists in passing sulphur dioxide through the slightly ammoniacal solution, precipitating in dilute, faintly acid, boiling solution with sodium thiosulphate with addition of dilute acetic acid, washing by decantation with hot 1 per cent. ammonium chloride, filtering and washing with hot water. Iron, zinc, manganese and magnesium in ordinary amounts do not interfere, but when the first two are present in large quantity a double precipitation is necessary.

Overheating Aluminium

The work described in a paper on "The Effects of Overheating and Melting on Aluminium," by Dr. W. ROSENHAIN and Mr. J. D. GROGAN, was undertaken to ascertain whether certain forms of treatment in the melting and re-melting of aluminium would bring about in the metal deterioration approximating to the condition generally described as "burnt" aluminium. It has been stated that exposure to an unduly high temperature during melting, and also repeated re-melting of the same material even at ordinary melting temperatures, brings about such deterioration. Both kinds of treatment were tried.

High grade aluminium was poured at temperatures up to 1,000° C. and also at the usual pouring temperature after heating for some hours at 1,000° C. The castings so obtained were rolled to sheet form and tested in the annealed state. No deterioration in the metal could be detected. High grade aluminium and also aluminium containing ½ per cent. each of iron and silicon were cast to ½ in. slabs and rolled to 0·01 in. sheet. This sheet was melted and cast and the whole process repeated ten times. Test pieces cut from sheet 0.05 in. thick from each melt gave figures which indicated no systematic change in the quality of the metal.

The Antimony-Bismuth System

In his paper on the above subject Mr. MAURICE COOK, M.Sc., stated that several workers have investigated the equilibrium diagram of these two metals, and though the opinion that the system is isomorphous is generally held, the diagram has never been completed. Early investigators gave only the liquidus curve and Hüttner and Tammann in 1905 gave, in

addition to a new liquidus curve, part of the solidus which they found to be horizontal at 266° ± 4° C. and extending from 0 to 70 per cent. of antimony.

In the present work very thorough thermal and microscopic investigations have been made. The results obtained, in addition to those from quenching and annealing experiments, show that the two metals form an isomorphous series of alloys. The liquidus curve is perfectly smooth and the solidus is horizontal at 270° C. up to 60 per cent. of antimony, after which it rises steeply to the freezing point of antimony. Chill cast and slowly cooled specimens reveal duplex structures, but with prolonged annealing—550 hours at 275° C.—the alloys become homogeneous.

Twin crystals and peculiar banded effects were observed in some of the annealed specimens. It is supposed that the twin crystals have been formed during the solidification of the alloy by stresses due to expansion, and have grown to visible dimensions on annealing. The nature of the " bands " has not been definitely ascertained, though they are not considered to be slipbands.

Intermetallic Actions

Mr. Q. A. Mansuri, by means of thermal analysis and microscopic analysis, has shown that thallium and arsenic do not act chemically with each other nor do they form solid solutions. They alloy in all proportions, and the equilibrium diagram of the system is a perfect case of the immiscibility type. In a paper read at the meeting the author stated that arsenic dissolves in molten thallium and lowers its freezing point until a solution of 8·01 per cent. arsenic freezes at the eutectic temperature of 215° C. Then the freezing points of the alloys gradually rise to 240° C. All alloys containing from 13 to about 40 per cent. arsenic begin to freeze at 240° C. and are made up of two layers—the upper layer rich in arsenic while the lower is rich in thallium. After about 40 per cent. arsenic, to nearly pure arsenic, the solution is uniform and the two layers disappear.

British Cellulose Developments

The Present Manufacturing Position

The secretary of the British Cellulose and Chemical Manufacturing Co., Ltd., in forwarding to shareholders a prospectus of the Cellulose Holdings and Investment Co., Ltd., says :—"We are now in a position to send you a copy of the prospectus of the issue of £500,000 7 per cent. debenture stock of the Cellulose Holdings and Investment Co., Ltd. As a shareholder, you may apply for as much of the debenture stock as you desire to secure ; but, as there is only £500,000 available in all, to be spread over shareholders holding £5,400,000 of preference and ordinary shares, we cannot say whether your application will be allotted in full or not. Shareholders in the British Cellulose Co. have, however, the preferential right of allotment."

The prospectus of the Cellulose Holdings and Investment Co., Ltd., shows that the share capital is £50,000, in 1,000,000 shares of 1s. each, and offers an issue of £500,000 7 per cent. participating first mortgage debenture stock, carrying fixed interest at 7 per cent. per annum, and, in addition, one-third of the profits of the company.

The proceeds of the issue will provide for the balance of the purchase price of the stock and the repayment of the temporary advances. The debenture stock so subscribed for by the company will be repayable by the British Cellulose Company at par on December 31, 1942, and redeemable by the operation of a cumulative sinking fund commencing October 1, 1927.

His Majesty's Government have agreed to transfer (without payment) to the company 750,000 7½ per cent. cumulative participating preference shares of £1 each in the British Cellulose Co. in order to assist it to finance that company.

The British Cellulose Co. has contracted to pay to the company a royalty at the rate of 2½ per cent. on the invoice price (less any cash discount) of all products of the British Cellulose Co. or its subsidiaries which are from time to time sold by the British Cellulose Co. or such subsidiaries and paid for, but if the net invoice price of the products sold and paid for in a year, together with the net invoice price or market price (as the case may be) of certain products of the British Cellulose Co.'s licensees and of assignees of any of its patents, on which royalty is also payable to the company and which are sold and paid for in such year, exceeds £2,000,000, the royalty on the excess in that year is to be reduced to 1 per cent. The royalty will terminate at the end of twenty-five years after the payments in respect thereof for any one year shall have amounted to £50,000.

The company has agreed to purchase the British Cellulose Co.'s generating station at Spondon for £200,000, which will be satisfied by the surrender of £200,000 of the above-mentioned 8 per cent. first mortgage debenture stock, when fully paid. The British Cellulose Co. will be precluded from reissuing the debenture stock so surrendered until its net profits cover the interest and sinking fund on the whole authorised issue at least three times and the company also consents. The company has agreed to resell the generating station to the Midland Counties Electric Supply Co., Ltd., for £100,000 in cash (of which £25,000 is payable on completion of the resale and the balance subsequently on February 1, 1923) and 225,000 fully-paid ordinary shares of £1 each in the latter company, ranking for dividend from July 1, 1923.

Progress of the Company

Information with regard to the progress of the British Cellulose Co. is given in the following letter from the chairman of that company, dated September 18 :—"You are aware that, as the result of the continued patient and persevering efforts of the management, experts, and staff of the British Cellulose Co., its fortunes have changed, and where disappointment has been its share in the past, we begin to see success. We have the exclusive rights to the Dreyfus patents for the British Empire, with the exception of Canada, and limit for the British Empire, with the exception of Canada, and limited rights to sell our products elsewhere. We feel that we are still at the beginning of the development of the enterprise. Our product has been so much improved that our customers are increasing the size of their orders. If we represent our sales for the month of April, 1922, as being 100, May was 128, June 161, July 210. August, a holiday month, shows a slight falling off.

"Costs show a gratifying reduction, quite apart from the reduction due to increased output. The present capacity of the plant is one ton per day, but actual business and indications of a growing demand are such that the directors have decided to proceed at once with such further expenditure as is necessary to bring the plant up to a capacity of three tons per day. It is expected that a substantial part of this extension will be operating by the end of the current year.

"In considering the question of extensions we have been encouraged by the assurance of our new associates, Fabrique de Soie Artificielle de Tubize, that we are justified in increasing the plant. Under contracts lately entered into, Fabrique de Soie Artificielle de Tubize will buy acetate of cellulose from the British Cellulose Co., from which it will manufacture artificial silk in Belgium, and a share of the royalty payable to Messrs. Dreyfus and Clavel thereon will come to the British Cellulose Co. Under these agreements Fabrique de Soie Artificielle de Tubize will give to the company the benefit of its long-established sales organisation on the Continent.

New Dyeing Process

"We had to learn to dye a new chemical product, and the experience gained in the dyeing of real silk and other artificial silks was not of much use to us. The firm of Clavel and Lindenmeyer, of Basle, Switzerland, were the first dyers to treat our product successfully, and their system has been installed at our factory at Spondon, and the plant is being enlarged to a capacity of two tons per day.

"This firm is also extending its own dyeing plant at Basle, and Fabrique de Soie Artificielle de Tubize inform us that they are arranging for the installation of this dyeing process in Belgium and at various other continental points, so that we do not anticipate any lack of dyeing facilities when these arrangements are completed.

"Up till now you will realise that I have been speaking of our artificial silk product only, which is known to the trade as Celanese. There are other products of our factories besides the manufacture of artificial silk, the development of which will cheapen the cost of the basic material from which our yarn is produced. Among these, our aeroplane varnish is still the standard non-inflammable covering for aircraft, and the plant erected during the late war is capable of supplying any conceivable demand for this material."

The "European Commercial"

An Organ of World-Wide Commerce

For the thoughtful man, inquiring as to the main preoccupation of the European nations at the moment, the first issue of the *European Commercial* provides an answer. It is evident that the anxiety of the nationals all over Europe is to have done with squabbling and to settle down in earnest to the rebuilding of international commerce. During the past week statesmen in all countries have had striking indications of the temper of the peoples whose destinies they guide; a new war was mentioned, and throughout the whole of Europe there was unanimous outcry against it. Business men desire nothing so much as to be let alone in order that they may join together those threads in the fabric of European trade which were so ruthlessly snapped in 1914. To every unbiassed person the *European Commercial* is evidence of a determination common to business men everywhere—a determination that in spite of all obstacles they will trade with each other—and it is this determination which accounts for the enthusiasm with which the first number has been welcomed.

A paper more truly international in its scope and more widely supported has never been published. Sir Ernest Benn, Bart., has for the past twelve months been engaged in active preparations in connection with it, and is very gratified with the immediate support which it has received. Unanimous expressions of approval have been sent from leading statesmen throughout Europe. Dated from 10, Downing Street is a message from the British Prime Minister in which he mentions his interest in the new paper, and congratulates Sir Ernest Benn on his enterprise. He expresses the hope that the *European Commercial* will lead to a better understanding and co-operation between the business communities of all the nations of Europe. Messages of welcome are also published in the first issue from the French Ambassador in London; the Minister of Industry and Commerce, Rome; the Royal Hungarian Ministry of Agriculture; the Austrian Minister in London; the Minister of Commerce of the Czechoslovak Republic; the Commercial Counsellor of the Polish Legation; the Minister of Commerce, Budapest; the Commercial Counsellor of the Danish Legation in London; the Swedish Consul-General in London; the Consul-General for Finland; the Latvian Consul-General in London; the Esthonian Minister, and many others.

Support from Traders

The *European Commercial* contains convincing indications also of the attitude of the trading communities of Europe in the number of announcements which it carries. Always cautious in their approach, and well advised on financial, commercial or journalistic ventures, the banking community has at once supported the paper. English, Scottish, American, French, Austrian, Polish, Czechoslovakian, Hungarian, Serbian and other important banking concerns are represented, and the business men of a dozen countries have recognised the utility of an independent newspaper dealing with the trade of Europe as a whole. The fact that there are advertisements from Great Britain, America, France, Belgium, Hungary, Jugo-Slavia, Ireland, Czechoslovakia, Poland, Australia and Italy, affords positive proof that the *European Commercial* is the type of business newspaper which was eagerly awaited in Europe.

As a production, as a specimen of typography, and on what may be called the technical side of the work, it equals anything which could be done with all the facilities to which publishers are accustomed in London. The paper, printing and illustrations are of the highest class, and in view of the much advertised plight of Austria it is interesting to see that Vienna is still able to maintain the high traditions of the printing arts which have for centuries been associated with her.

Stimulation of European Trade

As far as the editorial policy of the *European Commercial* is concerned, the sole aim of the paper is to help by every means in its power to stimulate European trade and commerce. It is already recognised as the link between the aspiring new countries in Eastern Europe and the more highly developed manufacturing countries further West. The new States which came into being after the war realise that the only sure foundation upon which they can build in order to flourish is that of lively trade and exchange between them and the industrial communities of Western Europe. How many business men in this country think of Finland as a rapidly developing, thickly populated country anxious to exchange for the products of other countries the output of industries which it is building up as rapidly as circumstances will permit.

In our view there is no need for the publication of a paper to create a better commercial understanding between the peoples of Europe. That understanding, which may best be described as the "will to trade," exists, but since the great war politicians, in endeavouring to find solutions for difficulties for which they themselves are largely responsible, have made it increasingly hard for European nationals to trade with each other. These mistakes will never be undone by politicians; the way to set the wheels of commerce going again is for business men to take matters into their own hands and begin to trade.

The editors of the *European Commercial* in Vienna have given a very different view of Europe from that which we are accustomed to find in the popular press. The kind of mental picture we too often get is of a Europe bristling with bayonets, whose people, when they are not squabbling with each other, are engaged in the manufacture of paper money. The editorial plan of the *European Commercial* is to take trading countries one by one, and to give an authoritative review of the commercial position of each at the moment. The countries are arranged alphabetically: Austria, Belgium, Britain, Bulgaria, Czechoslovakia, Denmark, France, Germany, Holland, Hungary, Italy, Jugo-Slavia, Roumania, Russia, Sweden, Switzerland, Turkey are all dealt with, not politically, but from the point of view of finance and industry. The *European Commercial* comes with its fifty pages of illustrations and descriptive matter to remind us that the peoples of Europe are for the most part engaged, just as we are in this country, in the manufacture and distribution of commodities. They realise, just as we do, that the more freely commodities are exchanged the greater the number of openings for trade with foreign countries, the higher will be their standard of living and the greater the general European prosperity.

For those whose views of their responsibility are limited to the shores of these islands the *European Commercial* will not perhaps appeal, but the world-wide commerce of this country has been built up by progressive manufacturers who admit no such limitations, and they will certainly watch the progress of the paper with the keenest interest. Those of us who have seen the inception and growth of the idea behind the *European Commercial* have reason to be proud of its immediate success. Sir Ernest Benn followed a bold policy in promoting the publication of the paper just at the moment when European trade was at its worst. The success which has attended his efforts will serve to remind an increasing number of business men in this country of the fact that the salving and up-building of European trade is in their hands.

The first issue of the paper has produced some surprises; it was, for instance, anticipated that Germany would be very largely represented, but as a matter of fact the first issue has appeared without any representation of this great centre of industry. That is a state of affairs which is unlikely to last, but it is interesting to notice that this commercial paper has drawn its support from almost all the other countries of Europe, though not from Germany for the moment. The extraordinary welcome which was given to the first announcement of the *European Commercial* made it an assured success from the start, but now that it is actually with us it will take its place as a power for good in European trading circles. For the first time we have a competent staff of English journalists situated right in the centre of the Continent, telling the world about Europe and its trading possibilities.

Explosion of Oxygen Cylinders

On Wednesday, between Sheffield and Hull, a motor lorry conveying 50 cylinders of oxygen to the British Oxygen Co., Ltd., Hull, exploded with such violence that the report of the explosion could be heard six miles away. A passing motorist drew the attention of the driver to the fact that his lorry was in flames, and the latter made an unsuccessful attempt to drag the cylinders to safety. One cylinder was blown up into the air and fell in a field a quarter of a mile away and other cylinders exploded in quick succession. The driver of the lorry was unhurt.

From Week to Week

Lord Leverhulme has accepted the presidency of the British Council of Interchange.

Mr. Henry Van den Bergh is now Chairman of Van den Berghs, Ltd., in place of the late Lord Ebury.

Mr. John Sutherland, works manager of B. Laporte, Ltd., has been appointed a director of the company.

A resolution authorising the War Secretary to lease the nitrate plants at Muscle Shoals has been introduced in the American House of Representatives.

The "Tentelew" oleum plant and the pyrites plant at H.M. Factory, Pembrey, South Wales, will be sold by auction at Pembrey on October 3 and following days.

It is reported from Jamaica that operations will shortly be resumed by the North American Aluminium Co. in connection with the exploitation of the bauxite fields of British Guiana.

Mr. Percy Lowe Norrington, one of the senior partners in the firm of Charles Norrington & Co., chemical manufacturers, Plymouth, has died at Scorhill, near Chagford, at the age of 53.

We regret to record the death at 6, Mansfield Road, Ilford, Essex, on September 14, of Margaret Elizabeth, wife of Dr. J. P. Longstaff, F.I.C., general secretary of the Society of Chemical Industry.

A silica which is claimed to be suitable for the production of glass without the aid of other ingredients is said to have been discovered by two Czech engineers. The deposits of the mineral are understood to be extensive.

A marriage was solemnised on September 27 at All Saints' Church, Margaret Street, London, W., between Major Herbert George Brackley and Miss Frida Mond, elder daughter of Mr. Robert Mond, J.P., of Combe Bank, Sevenoaks.

The death has occurred, at the age of 82, of Dr. William Kellner, F.I.C., who was at one time consulting chemist to the Royal Gunpowder Factory, Waltham Abbey. He served on the Council of the Institute of Chemistry from 1895 to 1898.

A Meyricke Scholarship at Jesus College, Oxford, open to graduates of the University of Wales and of St. David's College, Lampeter, has been awarded to Leon Rubinstein, of University College, Aberystwyth, with a view to research in chemistry.

The 45th anniversary of the foundation of the Institute of Chemistry will be celebrated by a dinner to be held at the King Edward VII. Rooms, Hotel Victoria, Northumberland Avenue, London, on Friday, November 17, at 7.30 p.m. Tickets are obtainable from the Registrar of the Institute.

Members of the Hull Chemical and Engineering Society recently visited the factory of John Stather and Sons, where the various processes used in the manufacture of wallpaper were demonstrated. The winter session of the Society opens on October 2 with a whist drive and concert at the Metropole Hall, Hull.

Mr. John Cheshire, who was recently appointed a managing director of Lever Brothers, Ltd., was on Monday entertained to a complimentary dinner at the Trocadero, London, by his friends of the Thirty and Aldwych Clubs. Mr. Cheshire is president of the Thirty Club and is a member of the Committee of the Aldwych Club.

In response to the invitation of the British Engineering Standards Committee to nominate a representative of the Institute of Chemistry to serve on the Sectional Committee on Cement in the place of the late Mr. Bertram Blount, the Council have selected Mr. Frank William Harbord, C.B.E., and he has accepted appointment.

A joint meeting of the Faraday Society and the British Cold Storage and Ice Association will be held on Monday, October 16, to discuss the subject of the generation of low temperatures. The meeting will be held at the Institution of Electrical Engineers, and will be divided into three sessions, 2.30 to 4, 4.45 to 6, and 7.45 to 10 p.m.

The third of the lectures arranged by the Institute of Physics, on physics and the physicist in industry, will be given by Mr. Clifford C. Paterson, on Wednesday, October 18, at 6 p.m., at the Institution of Electrical Engineers, Victoria Embankment, London, W.C.2. Mr. Paterson will deal with the Physicist in Electrical Engineering." Sir J. J. Thomson, president of the Institute will preside.

The following papers will be read at a meeting of The Chemical Society on October 5 at 8 p.m. :—" Cupric tetramine nitrite and the corrosion of copper by aqueous solutions of ammonia and of ammonium nitrate," by H. Bassett and R. G. Durrant; " The additive formation of four membered rings. Part I. The synthesis and resolution of some derivatives of tetrahydro—1 : 3—diazine," by C. K. Ingold and H. A. Piggott.

Automatic and Electric Furnaces, Ltd., inform us that the increasing demand for their Wild-Barfield electric furnaces and laboratory muffles has necessitated their removal to larger works and offices, and their address is now: Elecfurn Works, 173-175, Farringdon Road, London, E.C. 1. Telephone: Clerkenwell 5234. The company also intimate that their demonstration room is open to all chemists and engineers wishing to see various furnaces and muffles in operation.

New works for the production of alcohol for power and industrial purposes are to be erected at Hull. A site of 40 acres has been leased to the promoters by the North-Eastern Railway Co., and, when completed, the works will, it is stated, be the largest of the kind in the country. Alcohol will be specially prepared, particularly for use in the manufacture of varnishes, lacquers, soap, lubricants, flavouring extracts, photographic plates, artificial silk, dyes, celluloid, explosives, etc.

According to a Berlin newspaper a community of interests contract has been concluded between the Union of German Factories for Glass Instruments situated in Ilmenau and the Union of Thermometer and Glass Instrument Factories in Roda. An arrangement has been made with the Glassworks Schott und Genossen in Jena, Gustav Fischer in Ilmenau Greiner and Friedrich in Stutzerbach that the glass tubes manufactured by these factories shall only be sold to the firms belonging to both unions.

At the Leipzig Congress last week some further particulars of the effect of the drug known as Bayer 205 on sleeping sickness were given by Dr. Martin Mayer, of the Hamburg Institute for the Study of Tropical Diseases. He said that the drug was first produced in the research laboratories of the factory of Bayer and Co., at Leverkusen. In many respects it was far superior to any other known drug for the cure of sleeping sickness, and in its effect on the human body it represented a new type, hitherto unknown, of medical practice.

The Secretary for Mines has appointed a committee to carry out under the general direction of the Safety in Mines Research Board research into the causes of and the means of preventing the ignition of firedamp and coal dust by the firing of permitted explosives. The committee has been constituted as follows: Col. Sir F. L. Nathan (chairman), Mr. W. Rintoul, Dr. G. Rotter, Mr. H. Walker, and Professor R. V. Wheeler. A grant has been made by the Miners' Welfare Committee out of the Miners' Welfare Fund to meet the cost of initiating the research.

Mr. Joseph Fletcher, metallurgical chemist, employed at Lanywith and Gretna factories during the war, declares, according to an Exchange message from Melbourne, that as the result of English experience he has since learnt certain facts connected with the manufacture of dyes, having made experiments in a small laboratory. He claims that he has manufactured synthetic indigo by the Vuemann process, and friends are financing a small factory in which he will manufacture on a commercial basis. The raw material is obtainable in Australia. So far he has not submitted his plans to a board of experts.

Professor J. H. Andrew, in his opening address to the Metallurgical Department of the Royal Technical College, Glasgow, last week, dealt with the various theories of atomic structure and their importance in relation to metallurgical work. On the Lewis Langmuir theory of the atom it was possible, by knowing the structure of the various elements, not only to stipulate the physical properties of the known elements and many chemical compounds, but also to prophesy those of the unknown. These prophecies, he continued, had invariably been found to be correct when experimental evidence had eventually been given. The great trouble had been in its application to metallic systems, which obey no laws of valency. If only it became possible to bring into line metallic substances, to correlate physical properties with atomic and molecular configuration, all the physical and mechanical properties of metallic alloys could be foretold from this configuration alone.

References to Current Literature

British

OXIDATION.—The oxidation of hydrocarbons, with special reference to the production of formaldehyde. E. W. Blair and T. S. Wheeler. *J.S.C.I.*, September 15, 1922, pp. 303–310 T.

TAR.—Tar distilling. W. A. Walmsley. *J.S.C.I.*, September 15, 1922, pp. 296–298 T.

COKING.—The operation of Koppers by-product coke oven plant. C. E. Wallin. *J.S.C.I.*, September 15, 1922, pp. 298–300 T.

DYESTUFFS.—The acid alizarin dyestuffs. J. I. M. Jones. *J. Soc. Dyers and Col.*, August, 1922, pp. 201–203.

The constitution of Pigment Chlorine G G (M.L.B.) and of Lithol Fast Yellow G G (B.A.S.F.). F. M. Rowe and E. Levin. *J. Soc. Dyers and Col.*, August, 1922, pp. 203–204.

TEXTILE TREATMENT.—Preparation of cloth for finishing. S. H. Higgins and A. Hodge. *J. Soc. Dyers and Col.*, August, 1922, pp. 195–200.

CEMENT.—A study of conditions causing disintegration of cement under the "accelerated" test. A. G. Fleming. *J.S.C.I.*, September 15, 1922, pp. 300–302 T.

CARBOHYDRATES.—Some research problems in the carbohydrates. Cellulose, starch and inulin. J. C. Irvine. *J.S.C.I.*, September 15, 1922, pp. 362–365 R.

CRYSTALLOGRAPHY.—The significance of crystal structure. W. Bragg. *J.S.C.I.*, September 15, 1922, pp. 366–368 R.

TANKS.—A rapid and accurate method for the calibration of storage tanks. J. W. M'David. *J.S.C.I.*, September 15, 1922, pp. 295–296 T.

RUBBER.—Defects in plantation rubber: how to prevent them. J. Edwardes. *Rubber Age*, September, 1922, pp. 315–318.

Sulphur in vulcanised rubber. J. W. W. Dyer and A. R. Watson. *Rubber Age*, September, 1922, pp. 348–349.

Golden sulphide of antimony; composition of the commercial product used in the rubber industry. A. Short and F. H. Sharpe. *Rubber Age*, September, 1922, pp. 339–340.

ANALYSIS.—The determination of guanidine. A. H. Dodd. *Rubber Age*, September, 1922, pp. 344–346.

United States

TECHNOLOGY.—The modern chemical plant. F. D. Chase. *Chem. and Met. Eng.*, August 30, 1922, pp. 432–434.

Steam for power and process in the chemical and allied industries. H. B. Reynolds. *Chem. and Met. Eng.*, August 30, 1922, pp. 407–409.

The design of chemical plants. A. E. Marshall. *Chem. and Met. Eng.*, August 30, 1922, pp. 439–441.

Electrification of chemical and allied industries. C. B. Gibson. *Chem. and Met. Eng.*, August 30, 1922, pp. 453–456.

Gas as a source of energy for industrial processes. C. J. Wright. *Chem. and Met. Eng.*, August 30, 1922, pp. 442–443.

OXIDATION.—A study of side-chain oxidations with potassium permanganate. Part II. L. A. Bigelow. *J. Amer. Chem. Soc.*, September, 1922, pp. 2010–2019.

ORGANIC ARSENIC COMPOUNDS.—A sulphonated naphthylarsinic acid. A. E. Hill and A. K. Balls. *J. Amer. Chem. Soc.*, September, 1922, pp. 2051–2054.

Condensation products of arsphenamine with aldehydes. G. W. Raiziss and A. C. Blatt. *J. Amer. Chem. Soc.*, September, 1922, pp. 2023–2027.

TUNGSTATES.—The sodium tungstates. Part I. E. F. Smith. *J. Amer. Chem. Soc.*, September, 1922, pp. 2027–2036.

CERAMICS.—Manufacture of fireclay refractories. A. G. Wikoff. *Chem. and Met. Eng.*, September 6, 1922, pp. 505–509.

CRYSTALLOGRAPHY.—Electronic structures of crystals. Part I. M. L. Huggins. *J. Amer. Chem. Soc.*, September, 1922, pp. 1841–1850.

The crystal structure of silver molybdate. R. W. G. Wyckoff. *J. Amer. Chem. Soc.*, September, 1922, pp. 1994–1998.

ADSORPTION.—Adsorption by activated sugar charcoal. Part I. F. E. Bartell and E. J. Miller. *J. Amer. Chem. Soc.*, September, 1922, pp. 1866–1880.

ATOMIC WEIGHTS.—Observations on the rare earths. Part XII. The atomic weight of lanthanum. B. S. Hopkins and F. H. Driggs. *J. Amer. Chem. Soc.*, September, 1922, pp. 1927–1929.

CATALYSIS.—Organic catalysis. E. E. Reid. *J. Ind. Eng. Chem.*, September, 1922, pp. 838–839.

INTERMEDIATES.—The chemistry of intermediates. M. L. Crossley. *J. Ind. Eng. Chem.*, September, 1922, pp. 802–805.

GELATINE.—Recent chemical and technological advances in our knowledge of gelatine and glue. R. H. Bogue. *J. Ind. Eng. Chem.*, September, 1922, pp. 795–797.

French

ACIDS.—The manufacture of sulphuric acid by the contact process. Part VII. H. Braidy. *L'Ind. Chim.*, August, 1922, pp. 330–335.

ZINC.—Condensation of zinc vapour. A. Billaz. *L'Ind. Chim.*, August, 1922, pp. 336–339.

AMMONIA.—Catalysis and synthesis of ammonia. Part II. P. Firmin. *L'Ind. Chim.*, August, 1922, pp. 339–343.

ATMOSPHERE.—Actual state of the industry for the separation of oxygen, nitrogen and rare gases from the atmosphere. Part I. M. Zack. *L'Ind. Chim.*, August, 1922, pp. 349–350.

ALCOHOLS.—The chlorination of normal butyl alcohol. H. Gault and R. Guillemet. *Compt. rend.*, August 21, 1922, pp. 367–369.

Borneol from magnesium pinene chlorhydrate. G. Vavon and A. L. Berton. *Compt. rend.*, August 21, 1922, pp. 369–372.

FUEL.—Recent progress in the chemistry of coal and oil. D. Florentin. Bibliography. *Bull. Soc. Chim.*, August, 1922, pp. 721–749.

CATALYSIS.—Catalysts and chemical equilibrium. J. F. Durand. *Bull. Soc. Chim.*, August, 1922, pp. 759–762.

German

OZONE.—Ozone. E. H. Riesenfeld and G. M. Schwab. *Ber.*, July 8, 1922, pp. 2088–2099.

OXIDES.—Preparation of selenium dioxide. J. Meyer. *Ber.*, July 8, 1922, pp. 2082–2084.

Preparation of carbon suboxide on the large scale and the properties of pure carbon suboxide. E. Ott and K. Schmidt. *Ber.*, July 8, 1922, pp. 2126–2130.

ELEMENTS.—The constitution of chemical elements. F. Wächter. *Z. anorg. u. allg. Chem.*, July 21, 1922, pp. 1–13.

The decomposition of chemical elements. F. Wächter. *Z. anorg. u. allg. Chem.*, July 21, 1922, pp. 14–30.

ALKALOIDS.—The constitutions of scopolamine and scopoline. Hofmann's synthesis of scopoline. K. Hess and O. Wahl. *Ber.*, July 8, 1922, pp. 1979–2025.

ALLOYS.—Toxic properties of commercial ferro-silicon. N. Kurnakow and G. Urasow. *Z. anorg. u. allg. Chem.*, July 21, 1922, pp. 89–131.

VALENCY.—The secondary valency of the hydroxyl group. Part I. H. Reihlen. *Z. anorg. u. allg. Chem.*, August 8, 1922, pp. 173–195.

HYDROGENATION.—The hydrogenation of 1.6-dimethylnaphthalene. F. Mayer and T. Schulte. *Ber.*, July 8, 1922, pp. 2164–2167.

ANALYSIS.—The estimation of bismuth as metal. A. Kurtenacker and F. Werner. *Z. anorg. u. allg. Chem.*, August 8, 1922, pp. 166–170.

The estimation of sulphuric acid as barium sulphate; evidence of the existence of a complex barium salt. D. Balarew. *Z. anorg. u. allg. Chem.*, July 21, 1922, pp. 69–82.

Volumetric estimation of carbon and hydrogen in organic compounds. J. Lindner. *Ber.*, July 8, 1922, pp. 2025–2031.

BERYLLIUM COMPOUNDS.—Some beryllium compounds. J. Meyer and W. Schramm. *Z. anorg. u. allg. Chem.*, July 21, 1922, pp. 43–55.

Patent Literature

Abstracts of Complete Specifications

184,825. Ethers of Carbo-Hydrates, Process for the Production of. G. Young, 46, Church Crescent, Church End, Finchley, London, N.3. Application date, September 12, 1921.

The process is for producing a new class of ethers of carbohydrates which are insoluble in alcohol, benzene and water. These ethers are obtained by treating a carbo-hydrate with an alkyl chloride in the presence of a metallic hydroxide. The carbo-hydrate may be any form of cellulose, starch, dextrine, etc., and the alkyl chloride may be methyl chloride, ethyl chloride, propyl chloride, butyl chloride, or amyl chloride. The reaction is facilitated by the addition of a catalyst such as finely divided copper, and an organic solvent such as benzene, which does not react with the other ingredients. A mixture of 2 parts of the carbo-hydrate, 2 to 3 parts of the caustic alkali and 1 to 1·5 parts of water is treated with 20 molecular parts of the alkyl chloride to 1 molecular part of the carbo-hydrate. When using methyl or ethyl chloride, the mixture is preferably heated to 100° C. to effect the reaction, but no degradation or hydrolysis of the cellulose or alkyl chloride takes place. When using propyl, butyl, and amyl chlorides, the reaction is slower and the mixture must be heated to 100°–130° C. The reaction is effected in an autoclave heated by a water or an oil bath. The excess of alkyl chloride is recovered by distillation, and the ether obtained is freed from alkali by washing. The ether is soluble in glacial acetic acid, and is precipitated by adding water.

184,833. Nitrogenous Manures, Manufacture of. D. L. Monaco, 92, Via Depretis, Rome. Application date, April 7, 1921.

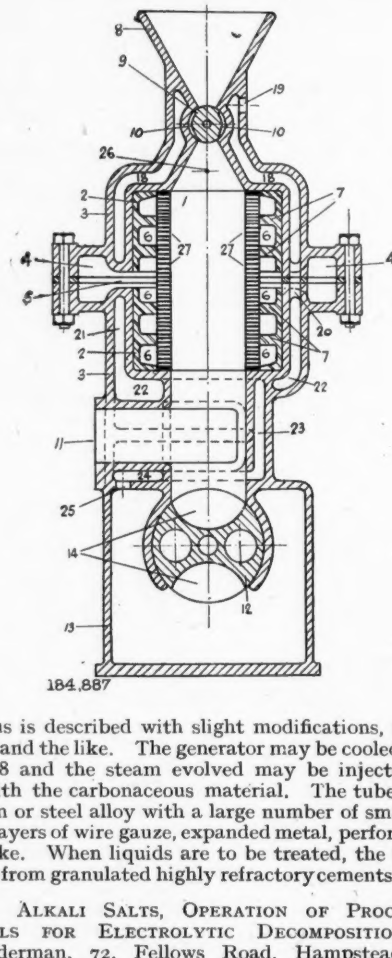
A chemical fertiliser is obtained by treating organic refuse usually employed as fertilisers, with halogen gases, which convert the fertilising ingredients into soluble compounds. Reference is directed in pursuance of Section 7, Sub-section 4 of the Patents and Designs Acts, 1907 and 1919, to Specifications Nos. 2,662/1873 and 4,103/1875.

184,880. Refining Clay, Especially China Clay. Plauson's (Parent Co.), Ltd., 17, Waterloo Place, London, S.W.1. From H. Plauson, 14, Huxter, Hamburg, Germany. Application date, May 21, 1921.

The process is for refining kaolin residues which may contain 40–60 per cent. of kaolin in addition to silicates and/or silicic acid. The clay is subjected to mechanical disintegration in a colloid mill such as described in Specification No. 155,836. (See The Chemical Age, Vol. IV., p. 313), and it is found that there is a selective colloidalising effect, and that the kaolin is transformed into a colloidal solution in a short time without affecting the silicic acid. The dispersion is accelerated by adding about 0·5 to 1 per cent. of water-glass, especially potassium water-glass, or tannin or other tanning agents, humus and humic acid, saponin, etc. The dispersion accelerator may alternatively be an inorganic colloid, or mineral salts known to form colloidal salts or gels by chemical reaction, or substances which increase the difference in the electrical charge between the particles which are to be separated by colloidalisation. Silicates and aluminates, ferrocyanides, sulphocyanides, and borates may be used for this purpose. The colloidal clay obtained in this manner is sufficiently fine to show Brownian movements under the ultra-microscope.

184,887. Gas Generators and/or Retorts. F. Umpleby and H. Powers, 24, Tufton Street, Silsden, near Keighley, Yorks. Application date, May 23, 1921.

The apparatus is for generating gas from carbonaceous materials such as coal, coke, charcoal, tar, vegetable matter, mineral or vegetable oils and the like, by passing the material through a porous refractory tube, the inner surface of which is maintained incandescent by surface combustion. The illustration shows an apparatus suitable for treating solid carbonaceous material. The combustible gaseous mixture is supplied to the chamber 4 and passes through ports 5 to an annular chamber 6 and thence through the pores of the refractory tube 1. The mixture burns on the inner walls of the tube. Overheating of the mixture in the chamber 6 is prevented by providing an aluminium cylinder 2 having projecting plugs 7 in contact with the tube 1 to conduct the heat away. Powdered carbonaceous and/or calcareous material is supplied from the hopper 8 through a rotary valve 9 and is gasified in the tube 1 by the heat radiated from the walls. The gas is discharged through the outlet 11, and the residue through an intermittently rotating valve 12 to a receptacle 13. Another



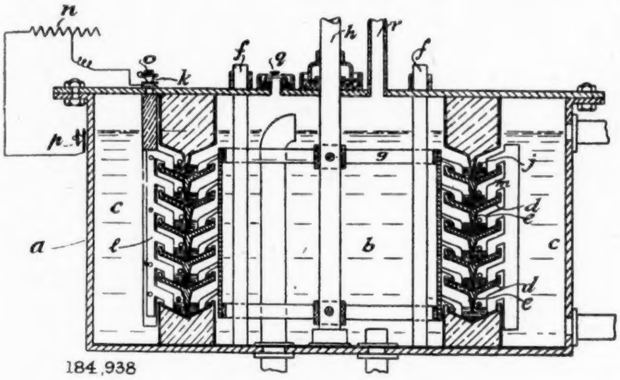
184,887

apparatus is described with slight modifications, for treating tar, oils, and the like. The generator may be cooled by a water jacket 18 and the steam evolved may be injected into the retort with the carbonaceous material. The tube 1 is made from iron or steel alloy with a large number of small holes 27, or from layers of wire gauze, expanded metal, perforated sheets, or the like. When liquids are to be treated, the tube 1 may be made from granulated highly refractory cements or fire-clay.

184,938. Alkali Salts, Operation of Processes and Cells for Electrolytic Decomposition of. M. Wilderman, 72, Fellows Road, Hampstead, London, N.W.3. Application date, June 16, 1921.

The apparatus is for the electrolytic decomposition of alkali salts using a series of mercury cathodes forming a decomposing and/or combining compartment. The object is to prevent the oxidation of the mercury or the formation of a solid amalgam. A circular metal tank *a* has the bottom lined with ebonite or other insulating material, and is divided into central and annular compartments *b*, *c* by a cylindrical partition. This partition is formed by a series of iron troughs *d* covered with an insulating material, each having a rib *e* dipping into the trough next below. Each trough contains mercury, so that mercury seals are formed in conjunction with the depending ribs *e*. Carbon anodes *f* are provided in the decomposing compartment *b*, and a rotary stirring device *g* is mounted on a shaft *h*. Small carbon or graphide anodes *j* are arranged on the surface of the mercury in the troughs *d*. The cathodes are connected by nickel contact pieces *l* to a copper connecting device *k* which is coated with insulating material on all surfaces immersed in the electrolyte, except that dipping into the mercury cathodes. The potential between the mercury in the various troughs is equalised by

devices m of conducting material. The use of the graphite electrodes j promotes local action for the decomposition of the amalgam, and the equalisation of the electrical potential in all the mercury cathodes prevents the flow of current from one



184,938

mercury cathode to another through the caustic and/or brine solution, and thus prevents the mercury cathodes from acting as anodes to some parts of the cells which act as secondary cathode or cathodes. The theory of the apparatus is described in detail.

184,948. Titanium Ores Containing Iron, Process of Treating. G. Carteret, 68, Rue Escudier, Boulogne-sur-Seine (Seine), France, and M. Devaux, 55, Rue de Rome, Paris. Application date, June 27, 1921.

The process is for the commercial preparation and purification of titanium chloride ($TiCl_4$), and its subsequent treatment for the production of titanium sulphate and oxide. In the usual process, the ore (rutile or titanic iron) is treated with strong acids, alkaline sulphates, or carbonates, but it is difficult to separate the iron from the titanic oxide. In the present process, the ore is subjected to preliminary reduction and then to two chlorinations at different temperatures, by which the iron and titanium chlorides are formed and volatilised separately. The ore is finely crushed, mixed with 5–11 per cent. of carbon, and placed in a retort which is freed from air by a current of reducing gas such as hydrogen, carbon monoxide, water-gas or generator gas. The temperature is then raised to 800° C. for two hours to reduce the ore. Alternatively, the carbon may be omitted and the ore reduced by a reducing gas. The ore is then chlorinated in a retort at 350° C., at which temperature the iron only is converted into chloride, volatilised, and drawn off. The temperature is then raised to 550°–600° C., and the chlorine is passed through in the reverse direction to produce titanium chloride, which is drawn off and condensed. The titanium chloride is mixed with traces of iron and silicon, and is redistilled at about 135° C. to purify the titanium chloride which distils at that temperature. The ferric chloride may be heated to recover the chlorine or lixiviated and then electrolysed to recover the iron and chlorine. The titanium chloride may be dissolved in dilute sulphuric acid to produce the sulphate. The sulphate solution may be diluted and boiled to precipitate metatitanic oxide, and the sulphuric acid obtained may be used for treating a fresh quantity of titanium chloride. The hydrochloric acid evolved may be absorbed in soda or potash, and the chlorine recovered for use again. Alternatively, the titanium chloride is dissolved in water, and neutralised by carbonate or oxide to produce hydrated titanium oxide, which coagulates. The solution of a chloride may be treated to recover the chlorine and alkali for use again.

184,961. Condensation Products of Phenolic Bodies with Aldehydic Compounds, Manufacture of. Lorival Manufacturing Co., Ltd., and A. A. Drummond, Norwood Works, Southall, Middlesex. Application date, July 7, 1921.

When phenols are condensed with formaldehyde or a polymer thereof, the final condensation may be accelerated by adding an aqueous acid to the initial product, but the final product obtained is not homogeneous. In the present invention, a glycerine solution of mineral acid is added in the proportion of 1 gram-equivalent of mineral acid to 900–1,400 grams of glycerine. Aqueous glycerine may be used, provided the proportion of water is not more than 30 per cent. In an example 20 parts by weight of a liquid condensation product made from formaldehyde or a polymer and phenol are mixed with 5 parts of glycerine and 2 parts of hypophosphorous acid of specific gravity 1·137, and 0·58 parts of hydrochloric acid of 32 per cent. strength. The mixture is soluble in spirit for use as a varnish, or it may be moulded and then hardened at 80°–100° C., yielding an insulating material of improved dielectric and mechanical strength.

184,966. Sulphuric Acid, Process for Producing the Effect of the Glover Tower in the Manufacture of —without the use of Glover Towers. T. Schmiedel, 3, Herderstrasse, Nurnberg-Doos, Germany. Application date, July 12, 1921.

In the usual chamber process for producing sulphuric acid, the combination of sulphur dioxide with atmospheric oxygen is effected in a Glover tower by introducing nitrogen-oxygen compounds as contact substances. The gases containing sulphur dioxide enter the lower part of the tower, and the nitrosyl sulphuric acid from the Gay-Lussac tower, together with nitric acid and chamber acid, are introduced at the top. The filling material of the tower becomes choked in course of time, and requires renewal, and the object is to avoid this disadvantage by dispensing with the Glover tower. The tower is replaced by mechanical apparatus in which hot or cold gases containing sulphur dioxide are brought into intimate contact with finely divided nitrosyl sulphuric acid, or sulphuric acid containing nitric acid. The reaction is effected in a chamber containing one or more rotating rollers, which spray the nitrosyl sulphuric acid. If the gases to be treated are hot, the rollers may be of cast iron or acid-proof ceramic material, but if the gases are cold the rollers may be of lead, or iron coated with lead.

194,984. Artificial Resins, Production of. A. Heinemann, Dorfstrasse 23, Berlin-Tempelhof, Germany. Application date, July 27, 1921.

Resins produced by the condensation of phenol and formaldehyde or paraformaldehyde are usually more brittle and their colour more unstable than that of natural resins. In the present invention, the physical and chemical properties of the artificial resins are stablised by adding an alkali glycerate such as sodium glycerate, after complete removal of water from the finished product. The resulting resin becomes more tough so that it may be bent without cracking when used as a varnish. A larger addition of sodium glycerate raises the melting point and reduces or destroys the solubility. If a soluble resin is required, the glycerate is added in the proportion of 1 to 2 per cent., and in the form of dry powder.

184,991. Refining Mineral Oils obtained from Earth Oil, Method of. C. R. Ehlers, Papenhuderstrasse 58, Hamburg, Germany. Application date, July 29, 1921.

The process for refining mineral oils is based on the different solubility of the constituent parts in aromatic amines containing a benzene nucleus such as phenyl-amine, toluidine or xylidine. It is found that if the oil is agitated with the amine to form an intimate mixture, and this mixture is then allowed to stand, the mixture settles into two layers, one containing the amine with the resinous, tarry and bituminous substances in solution, and the other the purified mineral oil. These layers may be separated by decanting, and the purified oil is treated with steam to expel the small quantity of amine contained in it. Suitable amines are found in the distillation products of anthracite coal-tar, particularly the heavier oils, or they may be obtained by nitrating the aromatic hydrocarbons obtained from anthracite coal-tar and reducing the products. In an example, a mixture of 100 parts of lubricating oil distillate and 30-70 parts of raw toluidine is agitated for one hour and then allowed to settle. The lower layer consists of toluidine with 10-25 per cent. of mineral oil and the resinous, tarry and bituminous substances. The upper layer of mineral oil is then freed from toluidine by steam treatment.

International Specifications not yet Accepted

183,428. SULPHONIC ACIDS OF 2 : 3-OXY-NAPHTHOIC ARYLIDES. Farbwerke vorm. Meister, Lucius, and Brüning, Hoechst-on-Main, Germany. International Convention date, July 19, 1921.

Examples are given in which β-oxynaphthoic anilide is sulphonated with sulphuric acid of 66° Bé, and β-oxynaphthoic 4-chlor-2-toluidide with sulphuric acid monohydrate to yield the respective sulphonic acids of 2 : 3-oxynaphthoic arylides.

183,476. VISCOSE AND ARTIFICIAL SILK. Naamlooze Vennootschap Hollandsche Kunstzijde Industrie, Breda, Holland (Assignees of H.M. Schadee, 11, Wijnhaven, Rotterdam). International Convention date, July 20, 1921.

Viscose is treated with an aqueous extract from wood, leaves, conifer needles, linseed and the like, and a salt of ammonia, triethylamine, pyridine, etc., these substances being added to the viscose itself or to the precipitating bath containing sulphuric acid. The extracts are obtained by boiling the raw materials with water under pressure, acidifying the extract, heating to boiling point, filtering and concentrating *in vacuo*. The extracting medium may also be an acid or a substance having an acid or an alkaline reaction. The extracting medium may be a 5 per cent. solution of sulphuric acid, or caustic soda, sodium carbonate, or ammonia. The extract obtained from conifer needles contains terpenes, which facilitate the precipitation process, and the other extracts may be enriched with turpentine, oil of turpentine, dipentene and the like. The extracts may be bleached with hydrosulphites, hydrogen peroxide, sodium peroxide or sodium perborate.

183,485. PURIFYING LIQUIDS. J. N. A. Sauer, 43, Johan Verhulststraat, Amsterdam. International Convention date, July 23, 1921.

Sugar juices or water may be purified and clarified by adding precipitated calcium salts such as calcium carbonate, sulphite, sulphate, phosphate, oxalate or tartrate. Alkalies may also be added to reduce acidity or produce an alkaline liquor. The calcium salt is filtered off and purified by ignition or treatment with hydrochloric acid for use again. The process may be combined with a water-softening process by means of zeolites.

183,806. DYEING CELLULOSE ACETATE. Soc. Chimique des Usines du Rhône, 21, Rue Jean-Goujon, Paris. International Convention date, July 27, 1921.

Threads or films of cellulose acetate are treated at 60°-70° C. with a solution of disodium phosphate and caustic soda either before or during dyeing.

183,816. TUNGSTEN AND TUNGSTEN COMPOUNDS. Naamlooze Vennootschap Philips' Gloeilampenfabrieken, Noord-Brabant, Emmasingel, Eindhoven, Holland. International Convention date, July 29, 1921.

The starting materials are compounds of tungstic acid with silicic acid and boric acid. These are produced by boiling sodium tungstate with water-glass and acetic acid, or with silicic acid, or by boiling tungstic acid and ammonia with silicic acid, or by boiling together sodium tungstate and boric acid. The boiling is continued until the addition of strong hydrochloric acid does not precipitate tungstic acid. The complex tungstic acid is crystallised from an oily layer which separates when the liquor is poured into strong hydrochloric acid, and the crystallised product may be reduced with hydrogen to yield tungsten powder for the manufacture of electric lamp filaments.

LATEST NOTIFICATIONS.

186,035. Phosphatic fertilisers. Kreiss, A. L. September 13, 1921.

186,040. Extraction of fatty and other matters by means of volatile solvents. Zipser, S. September 10, 1921.

186,043. Process for the manufacture of alimentary flours. Schoen, M. September 15, 1921.

186,057. Manufacture of products for dyeing or printing textile fibres and other materials. Durand and Huguenin Soc. Anon. September 16, 1921.

Specifications Accepted, with Date of Application

164,002. Methylsulphites of secondary aromatic-aliphatic amines, manufacture of. Farbwerke vorm. Meister, Lucius and Bruning. May 31, 1920.

165,722. Waste liquors from pulp mills and similar liquors, Apparatus for the evaporation and dry distillation of. Aktiebolaget Cellulosa. June 29, 1920.

167,781. Aliphatic dialkylaminoalkyl compounds, Manufacture of. Farbwerke vorm. Meister, Lucius and Bruning. August 13, 1920.

185,433. Cellulose intended for the manufacture of viscose, Preliminary treatment of. W. Cross (*Technochemia Akt.-Ges.*). March 4, 1921.

185,439. Cracked petroleum oils and process and apparatus for producing same. L. W. Goold (*Universal Oil Products Co.*). March 11, 1921.

185,451. Stills. A. C. Jewell. April 28, 1921.

185,461. Carbonising fuel in vertical retorts. Woodall, Duckham and Jone (1920), Ltd., and Sir A. M. Duckham. May 3, 1921.

185,612. Triaryl-methane colouring matters, Manufacture of. British Dyestuffs Corporation, Ltd., A. G. Green, K. H. Saunders and S. C. Bate. August 17, 1921.

185,624. Oil-cracking process and apparatus therefor. C. A. Jensen. (*J. A. Stone.*) August 27, 1921.

185,632. Cracking hydrocarbons, Process of and apparatus for. F. G. Niece. September 7, 1921.

185,659. Aqueous solutions containing oxygen and method of producing same. O. Y. Imray. (*Aquazone Laboratories Inc.*) October 13, 1921.

185,681. Filling bodies for absorption towers. H. Prym. November 29, 1921.

185,684. Low-temperature carbonisation, System of. J. A. Yeadon. December 5, 1921.

183,428. Sulphonic acids of the 2 : 3-oxynaphthoic acid arylides. Manufacture of. Farbwerke vorm. Meister, Lucius and Bruning. July 19, 1921.

Applications for Patents

Aguillon, J. E. Recovering benzol contained in gas. 25377. September 19.

Allgemeines Deutsches Metallwerk Ges. Bronze alloys, and processes for their production. 25198. September 18. (Germany, September 20, 1921.)

Allgemeines Deutsches Metallwerk Ges. Copper and zinc alloys, and processes for production thereof. 25199. September 18. (Germany, September 21, 1921.)

Asahi Glass Co., Ltd., and Igawa, M. Process for application of colloidal magnesium silicate as a forcing agent of manure. 25538. September 21.

Badische Anilin & Soda Fabrik, and Johnson, J. Y. Manufacture and production of vat dyestuffs. 25209. September 18.

Badische Anilin & Soda Fabrik, and Johnson, J. Y. Manufacture of vat dyestuffs and intermediate products therefor. 25362. September 19.

Barron, C. A., Halliwell, J., and Hindley, N. Method of manufacture of a highly concentrated aqueous solution of aluminium acetate. 25742. September 23.

Bateman, H. E. G. Rubber solutions or cements. 25229. September 18.

Breisig, A. Gasifying bituminous fuel. 25378. September 19.

British Cellulose and Chemical Manufacturing Co., Ltd. Manufacture of artificial filaments, threads, etc. 25694. September 22.

Calvert, G. Treatment of alcohols. 25803. September 23.

Chemische Fabrik Griesheim-Elektron, and Imray, O. Y. Manufacture of mono-azo dye-stuffs. 25232. September 18.

Chemische Fabrik Griesheim-Elektron, and Mond, A. Process for treatment of chrome iron ore. 25720. September 22.

Cowlishaw, F. S., Garnett, C. S., Greenwood, F. E. S., and Reid, W. A. Decalcification of dolomite, magnesian limestone, etc., and production of magnesia. 25415. September 20.

Day, D. T. Extracting hydrocarbon oil material from oil-bearing earthy material. 25211. September 18.

Evans, E. V., and South Metropolitan Gas Co. Manufacture of smokeless fuel. 25231. September 18.

Graham, C. Stop-motion mechanism for dyeing, etc., machines. 25509. September 21.

Howard, H. Purification of hydrofluoric acid. 25221. September 18. (United States, September 29, 1921.)

Mathesius, H., and Mathesius, W. Making alloys of lead with calcium, strontium, and barium. 25609. September 21.

Mehner, H. Process for production of zinc in reverberatory furnaces. 25670. September 22.

Pellegrini, G., and Poma, G. Manufacture of acid H (amino-naphthol-disulphonic 1.3.6.8). 25351. September 19. (Italy, December 12, 1921).

Sutcliffe, E. R. Briquetting fuel, etc. 25731. September 22.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

LONDON, SEPTEMBER 28, 1922.

THERE has been a distinct improvement in trade during the past week, and consumers' interests are coming forward again after the holiday season. A satisfactory volume of business is evident, and prices generally tend upwards.

Export trade remains quiet.

General Chemicals

ACETONE has advanced in price and is very scarce in all positions.

ACID ACETIC is much dearer, and is likely to still further increase in value.

ACID CITRIC is uninteresting and the tendency is in buyers' favour.

ACID FORMIC has been a better market. The reduced price seems to have stimulated business.

ACID LACTIC is slow of sale, but the price is maintained.

ACID TARTARIC is rather weak, owing to a poor demand.

BARIUM CHLORIDE has eased off slightly, but manufacturers are well sold, and little change in the price is likely for some little time.

COPPER SULPHATE is unchanged.

CREAM OF TARTAR is an active market. Prices are firm, and stocks are on the small side.

FORMALDEHYDE has strongly advanced in price, and supplies for early delivery appear to be inadequate.

IRON SULPHATE remains unchanged.

LEAD ACETATE is in good demand, and higher prices are expected in sympathy with other acetic products.

LEAD NITRATE is featureless.

LIME ACETATE.—There has been a substantial advance in price, thereby affecting many other products.

LITHOPONE is in good demand, and the price tends upwards.

MAGNESIUM CHLORIDE is unchanged.

METHYL ALCOHOL has strongly advanced in price, with a consequent effect upon its derivatives.

POTASSIUM CARBONATE.—The improved turnover has not been maintained. The price is inclined to sag a bit.

POTASSIUM CAUSTIC.—There is no change in price, but the turnover is nominal.

POTASSIUM CHLORATE is in fair demand at recent figures.

SODIUM ACETATE is scarce for early delivery. Higher prices are expected.

SODIUM HYPOSULPHATE is without special feature,

SODIUM NITRITE has been in much better demand, and makers' prices have advanced.

SODIUM PHOSPHATE remains unchanged.

SODIUM PRUSSIATE is a strong market. Makers are well sold for the first few months of next year.

ZINC OXIDE is in good demand, and the market tends to favour sellers.

Coal Tar Intermediates

There is little of interest to report in this market, and trading is still confined on a narrow limit.

ALPHA NAPHTHOL is without change and with only a small trade passing.

ALPHA NAPHTHYLAMINE has been in slightly better request.

ANILINE OIL meets with a small demand, and is idle on export account.

BETANAPHTHOL is slightly firmer in second hands, and a better business is reported.

BETA NAPHTHYLAMINE is without change.

DIMETHYLANILINE is only occasionally called for.

DIPHENYLAMINE continues firm, with a small business.

" G " SALT is inactive.

" H " ACID has been in fair request, without change in value.

NAPHTHIONIC ACID is in poor demand.

NITRO BENZOL is quiet and easy.

PARANITRANILINE has been more active, and some fair business is reported.

RESORCIN is very quiet.

XYLIDINE.—A few small orders have been placed.

Coal Tar Products

The market maintains a fairly steady tone in most coal tar products.

90's BENZOL does not seem to be affected to any great extent by the large drop in petrol which has been reported, and is worth about 2s. per gallon on rails.

PURE BENZOL is inactive, and is worth about 2s. 4d. per gallon on rails.

CREOSOTE OIL remains steady for the near position, and is quoted at 5¾d. per gallon to 6d. on rails in the North, and 6½d. to 7d. per gallon in the South.

CRESYLIC ACID is still in a somewhat unsettled condition owing to the new American tariff, and is worth about 2s. 4d. per gallon on rails for the pale quality, 97/99%; while the dark, 95/97%, is worth about 2s. to 2s. 1d. per gallon.

SOLVENT NAPHTHA is fairly steady, and is well bought for prompt. It is worth about 1s. 9d. per gallon on rails.

HEAVY NAPHTHA is inactive, and is worth about 1s. 8d. per gallon.

NAPHTHALENE is weak, and has very little business.

PITCH.—The upward tendency still continues, and higher prices have been paid at most ports. To-day's quotations are 94s. to 95s., f.o.b. East Coast; 95s. to 97s. 6d. f.o.b. London; and 90s. to 92s. 6d. f.o.b. West Coast.

Sulphate of Ammonia

There is no change to report.

Current Prices

Chemicals

	Per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	1	8	to	0	1	10
Acetone oil	ton	80	0	0	to	82	10	0
Acetone, pure	ton	105	0	0	to	110	0	0
Acid, Acetic, glacial, 99–100%	ton	67	0	0	to	68	0	0
Acetic, 80% pure	ton	47	0	0	to	48	0	0
Arsenic, liquid, 2000 s.g.	ton	67	0	0	to	70	0	0
Boric, cryst.	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39–40%	lb.	0	0	6	to	0	0	6½
Citric	lb.	0	2	2	to	0	2	3
Formic, 80%	ton	57	10	0	to	60	0	0
Gallic, pure	lb.	0	2	11	to	0	3	0
Hydrofluoric	lb.	0	0	7½	to	0	0	8½
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	44	0	0
Nitric, 80 Tw.	ton	30	0	0	to	31	0	0
Oxalic	lb.	0	0	7¾	to	0	0	8
Phosphoric, 1.5	ton	38	0	0	to	40	0	0
Pyrogallic, cryst.	lb.	0	5	9	to	0	6	0
Salicylic, Technical	lb.	0	0	10½	to	0	1	0
Salicylic, B.P.	lb.	0	1	5	to	0	1	6
Sulphuric, 92–93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	2	3	to	0	2	9
Tartaric	lb.	0	1	4½	to	0	1	5
Alum, lump	ton	10	0	0	to	10	10	0
Alum, chrome	ton	28	0	0	to	29	0	0
Alumino ferric	ton	9	0	0	to	9	5	0
Aluminium, sulphate, 14–15%	ton	10	10	0	to	11	0	0
Aluminium, sulphate, 17–18%	ton	11	10	0	to	12	0	0
Ammonia, anhydrous	lb.	0	1	8	to	0	1	9
Ammonia, .880	ton	33	0	0	to	35	0	0
Ammonia, .920	ton	21	0	0	to	23	0	0
Ammonia, carbonate	lb.	0	0	4	to	0	0	4½
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	35	0	0	to	37	10	0
Ammonia, nitrate (pure)	ton	35	0	0	to	40	0	0
Ammonia, phosphate	ton	70	0	0	to	72	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered	ton	44	0	0	to	46	0	0
Barium, carbonate, 92–94%	ton	12	10	0	to	13	0	0
Barium, Chlorate	ton	65	0	0	to	70	0	0

	Per	£	s.	d.		£	s.	d.
Barium Chloride	ton	22	0	0	to	22	10	0
Nitrate	ton	27	10	0	to	30	0	0
Sulphate, blanc fixe, dry	ton	20	10	0	to	21	0	0
Sulphate, blanc fixe, pulp	ton	10	5	0	to	10	10	0
Sulphocyanide, 95%	lb.	0	1	0	to	0	1	3
Bleaching powder, 35–37%	ton	12	0	0	to		—	
Borax crystals	ton	29	0	0	to	33	0	0
Caffein	lb.	0	13	6	to	0	14	6
Calcium acetate, Brown	ton	10	10	0	to	11	10	0
„ „ Grey	ton	15	10	0	to	16	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	6	0	0	to		—	
Carbon bisulphide	ton	50	0	0	to	52	0	0
Casein technical	ton	47	0	0	to	55	0	0
Cerium oxalate	lb.	0	4	6	to	0	4	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	6	0	to	0	6	6
Oxide, black	lb	0	9	6	to	0	10	0
Copper chloride	lb.	0	1	2	to	0	1	3
Sulphate	ton	26	10	0	to	27	0	0
Cream Tartar, 98–100%	ton	108	0	0	to	110	10	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde, 40% vol.	ton	74	0	0	to	76	0	0
Formusol (Rongalite)	lb.	0	2	6	to	0	2	9
Glauber salts, commercial	ton	5	0	0	to	5	10	0
Glycerine, crude	ton	65	0	0	to	67	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	5	to	0	2	6
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	41	0	0	to	42	0	0
Carbonate (White Lead)	ton	43	0	0	to	47	0	0
Nitrate	ton	44	10	0	to	45	0	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	23	10	0	to	24	0	0
Magnesium chloride	ton	7	0	0	to	7	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	8	0	0	to	8	10	0
Sulphate (Druggists')	ton	13	10	0	to	14	10	0
Manganese, Borate, commercial	ton	65	0	0	to	75	0	0
Sulphate	ton	60	0	0	to	62	0	0
Methyl acetone	ton	70	0	0	to	75	0	0
Alcohol, 1% acetone	ton	70	10	0	to	75	0	0
Nickel sulphate, single salt	ton	49	0	0	to	51	0	0
Ammonium sulphate, double salt	ton	51	0	0	to	52	0	0
Potash, Caustic	ton	33	0	0	to	34	0	0
Potassium bichromate	lb.	0	0	6¼	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride, 80%	ton	12	0	0	to	12	10	0
Chlorate	lb.	0	0	4½	to	0	0	5
Metabisulphite, 50–52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	9	to	0	0	10
Prussiate, red	lb.	0	4	6	to	0	4	9
Prussiate, yellow	lb.	0	1	7	to	0	1	8
Sulphate, 90%	ton	13	0	0	to	13	10	0
Salammoniac, firsts	cwt.	3	3	0	to		—	
Seconds	cwt.	3	0	0	to		—	
Sodium acetate	ton	24	10	0	to	24	15	0
Arseniate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	5	to		—	
Bisulphite 60–62%	ton	23	0	0	to	24	0	0
Chlorate	lb.	0	0	3¾	to	0	0	4
Caustic, 70%	ton	20	10	0	to	21	0	0
Caustic, 76%	ton	21	10	0	to	22	10	0
Hydrosulphite, powder, 85%	lb.	0	1	9	to	0	2	0
Hyposulphite, commercial	ton	12	10	0	to	13	10	0
Nitrite, 96–98%	ton	29	10	0	to	30	0	0
Phosphate, crystal	ton	16	10	0	to	17	0	0
Perborate	lb.	0	0	11	to	0	1	0
Prussiate	lb.	0	0	11½	to	0	1	0
Sulphide, crystals	ton	12	10	0	to	13	10	0
Sulphide, solid, 60–62%	ton	21	10	0	to	23	10	0
Sulphite, cryst.	ton	12	10	0	to	13	0	0
Strontium carbonate	ton	55	0	0	to	60	0	0
Strontium Nitrate	ton	50	0	0	to	55	0	0
Strontium Sulphate, white	ton	6	10	0	to	7	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	4	to	0	1	5
Theobromine	lb.	0	12	6	to	0	13	0
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride 102° Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96–98%	ton	25	0	0	to	30	0	0
Oxide, 99%	ton	36	0	0	to	38	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	1
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	0	to	0	1	1
Anthracene, 40–50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	4	0
Benzidine, base	lb.	0	5	3	to	0	5	6
Benzidine, sulphate	lb.	0	5	3	to	0	5	6
Benzoic acid	lb.	0	1	9	to	0	2	0
Benzoate of soda	lb.	0	1	7½	to	0	1	9
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	1	4	to	0	1	4½
Betanaphthylamine, technical	lb.	0	5	0	to	0	5	6
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	9	to	0	3	0
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	0	11	to	0	1	0
Dinitronaphthalene	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	1	9	to	0	2	0
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	3	to	0	6	9
Metaphenylenediamine	lb.	0	4	9	to	0	5	3
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6½
Metatoluylenediamine	lb.	0	4	6	to	0	4	9
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude	lb.	0	3	0	to	0	3	3
Naphthionate of Soda	lb.	0	3	0	to	0	3	3
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitrobenzol	lb.	0	0	9	to	0	0	9½
Nitronaphthalene	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	12	0	to	0	12	6
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	8	to	0	0	10
Para-amidophenol, base	lb.	0	9	0	to	0	9	6
Para-amidophenol, hydrochlor	lb.	0	8	6	to	0	9	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	6	0	to	0	6	6
Phthalic anhydride	lb.	0	2	9	to	0	3	0
Resorcin, technical	lb.	0	4	6	to	0	5	0
Resorcin, pure	lb.	0	6	9	to	0	7	0
Salol	lb.	0	2	0	to	0	2	3

Institution of Chemical Engineers

THE thirteenth meeting of the Provisional Committee of the Institution of Chemical Engineers was held on Wednesday, September 20, when the solicitors announced receipt from the Board of Trade of a letter stating that "The application for a licence to register the Institution under the provisions of Section 20 of the Companies (Consolidation) Act, 1908, had now been entertained."

The Secretary reported that over 180 applications for membership had been received, and that the Selection Committee had considered a large number of these applications, and recommended that the names of the gentlemen selected by the Selection Committee in the first instance be brought before the first Council as soon as formed.

The report of the Sub-Committee of the relations between the Chemical Engineering Group and the Institution of Chemical Engineers was considered, and action was postponed until a later date.

A vote of thanks was carried unanimously to Mr. Pilcher and the Council of the Institute of Chemistry for their kind assistance in explaining fully their office organisation. It was arranged that the next meeting of the Committee be held on Wednesday, October 18 next.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.*

GLASGOW, SEPTEMBER 27, 1922.

THE chemical market during the past week continued very quiet, and while a fair number of inquiries were received, the number of orders booked left much to be desired.

Benzol is weaker, and lower prices are anticipated in view of the reduction of 5½d. per gallon on petrol.

Industrial Chemicals

ACID ACETIC.—Glacial, 98/100%, quoted £58 to £64 per ton; 80% technical, £38 to £39 per ton; 80% pure, £44 to £45 per ton.

ACID BORACIC.—Prices unchanged, crystals or granulated, £60 per ton, powdered, £62 per ton.

ACID CITRIC.—Offered at 2s. 2d. net per lb.

ACID HYDROCHLORIC.—Makers' price unchanged. 6s. 6d. per carboy, ex works.

ACID NITRIC 80°.—Quoted £27 per ton, ex station, in carboys.

ACID OXALIC.—Price about 7½d. to 7¾d. per lb., delivered.

ACID SULPHURIC.—144°, £4 per ton; 168°, £7 5s. per ton, ex works; de-arsenicated, £1 per ton more.

ACID TARTARIC.—Price about 1s. 3½d. per lb.

ALUM, LUMP POTASH.—Moderate inquiry, £15 10s. to £16 per ton.

ALUMINA SULPHATE.—Continental material at £10 10s., c.i.f., for 17/18%; £8 10s., c.i.f., for 14/15%. Prompt shipment.

AMMONIA CARBONATE.—Price unchanged. Lump, 4d. per lb.; powdered, 4½d. per lb., delivered.

AMMONIA LIQUID, 880°.—£30 per ton, delivered works

AMMONIA MURIATE.—Galvanisers' grey, about £26 per ton, c.i.f. U.K. Fine white crystals offered at £24 10s. per ton, c.i.f.

AMMONIA SULPHATE.—25¼%, £14 15s. per ton; 25¾% neutral, £14 18s. per ton, ex works, September/October.

AMMONIA SULPHITE.—Supplies offered at £52 10s. per ton, free on rails.

ARSENIC, WHITE POWDERED.—A few inquiries. Price now £46 to £47 per ton, ex quay.

BARIUM CHLORIDE.—Offered at £19 per ton, c.i.f. U.K.

BARYTES.—English make finest white at £5 10s. per ton, ex works. Finest white German offered at £5 per ton, c.i.f.

BLEACHING POWDER.—English makers' price unchanged. £12 15s. per ton, ex station, spot delivery.

BORAX.—Prices unchanged. Crystal or granulated, £29 per ton; powdered £30 per ton.

CALCIUM CHLORIDE.—English make, £6 per ton, ex quay. Continental material £5 per ton, c.i.f. U.K.

CARBON TETRACHLORIDE.—Supplies offered at £73 per ton, ex warehouse.

COPPERAS, GREEN.—Quoted £3 15s. per ton, ex works.

FORMALDEHYDE, 40%.—Spot lots offered at £67 per ton, ex quay.

GLAUBER SALTS.—Finest white commercial crystals, £5 per ton, ex store.

IRON BORINGS.—Prices inclined to be higher, at about 50s. per ton delivered.

LEAD.—Red, £37 15s. per ton, white, £49 15s. per ton—delivered U.K. minimum 5-ton lots. German material offered at £33 per ton, ex quay, prompt.

LEAD ACETATE.—Fine white crystals offered at £37 per ton, c.i.f. U.K.

MAGNESITE.—Finest Euboean, £9 per ton c.i.f. U.K. Spot lots, £11 per ton. Synthetic offered at £7 per ton ex store.

MAGNESIUM CHLORIDE.—Spot lots offered at £5 10s. per ton, ex store.

MAGNESIUM SULPHATE (EPSOM SALTS).—Price unchanged. Commercial £7 5s. per ton; B.P. £9 10s. per ton.

POTASSIUM BICHROMATE.—English makers' price, 6¼ per lb. delivered.

POTASSIUM CARBONATE.—90/92%, about £28 to £29 per ton; 96/98%, £32 per ton, ex store.

POTASSIUM CAUSTIC, 88/90%.—Spot lots on offer at £29 10s. per ton.

POTASSIUM CHLORATE, 98/100%.—About 4¼d. to 4½d. per lb. delivered.

POTASSIUM NITRATE (SALTPETRE).—Price for spot delivery, £32 per ton, ex store. Offered for prompt shipment at £24 per ton c.i.f.

POTASSIUM PERMANGANATE.—Commercial crystals, 7¾d. to 8d. per lb.

PYRITES.—Norwegian non-cupreous fines offered at 7½d. per unit of sulphur, c.i.f. U.K. port.

SODIUM BICARBONATE.—Refined quality, £10 10s. per ton, ex quay; m.w. quality, £9 10s. per ton.

SODIUM BICHROMATE.—English makers' price 5d. per lb. delivered.

SODIUM CARBONATE (SODA CRYSTALS).—Price £5 10s. to £5 15s. per ton, ex quay.

SODIUM CAUSTIC.—76/77%, £23 5s. per ton; 70/72%, £21 5s. per ton; 60% broken, £24 per ton; powdered 98/99%, £26 15s. to £27 15s. per ton, ex station; caustic soda bottoms, £14 per ton ex store.

SODIUM HYPOSULPHITE.—Commercial crystals about £13 per ton ex station; pea crystals, £18 per ton, ex station.

SODIUM NITRATE.—Refined, £12 10s. per ton, f.o.b.; double refined, £18 10s. f.o.b., Continental port.

SODIUM NITRITE.—Price £31 per ton, basis 100%.

SODIUM SILICATE, 140°.—Quoted £11 per ton, f.o.b. for export.

SODIUM SULPHATE (SALTCAKE 95%).—Price for home consumption, £4 per ton. Export quotations about £1 per ton higher.

SODIUM SULPHIDE.—60/62%, Continental make £16 per ton c.i.f., U.K.; 30/32% crystals, £9 per ton, c.i.f.

SULPHUR.—Government surplus stocks of Sicilian thirds, £3 15s. per ton; roll, £12 per ton; rock, £11 per ton; ground, £11 per ton, flowers, £13 per ton. Prices nominal.

TIN CRYSTALS.—Price unchanged, 1s. 2d. per lb.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZOIC ACID.—Small inquiry. Price quoted, 2s. 3d. per lb. delivered.

BENZOL.—More plentiful supplies are coming on the market, and prices have been influenced by the drop in the price of petrol.

BETANAPHTHOL.—Offered at prices varying from 1s. 1½d. to 1s. 3d. per lb. according to quantity.

CROCEINE ACID.—Home inquiry. Price quoted 2s. 11d. per lb. on 100% basis, delivered.

DIPHENYLAMINE.—Export inquiry. Price quoted, 4s. 2½d. per lb. f.o.b.

PURE TOLUOL.—Supplies are offered at 2s. 3¾d. per gallon ex works.

"R" SALT.—Home inquiry. Offered at 3s. 3d. per lb. delivered, 100% basis.

SODIUM NAPHTHIONATE.—Home inquiry. Price quoted, 2s. 9½d. per lb. 100% basis, carriage paid.

Government Contracts

The following were among the Government contracts let during August:—

ADMIRALTY (CIVIL ENGINEER-IN-CHIEF'S DEPT.).—*Explosives:* Nobel Industries, Ltd., London. *Portland Cement:* The British Standard Cement Co., London.

WAR OFFICE.—*Portland Cement:* Cement Marketing Co., Ltd., Medway. *Nickel:* Mond Nickel Co., Ltd., London. *Paint:* Alexander, Fergusson and Co., Ltd., Glasgow; Brimsdown Lead Co., Ltd., Brimsdown. *Soap, Laundry:* C. Thomas and Brothers, Ltd., Bristol. *Soap, Soft:* Hull Oil Manufacturing Co., Ltd., Hull. *Zinc Spelter:* British Metal Corporation, Ltd., London.

CROWN AGENTS FOR THE COLONIES.—*Anti-Corrosive Compositions:* Red Hand Compositions, Ltd., London. *Blasting Powder:* W. H. Wakefield and Co., Gatebeck Gunpowder Mills, near Kendal. *Gelignite:* Nobel Industries, Ltd., London. *Novarsenobillon:* May and Baker, Ltd., London.

The Manchester Chemical Market

[FROM OUR OWN CORRESPONDENT.]

Manchester, September 28.

ALTHOUGH the chemical market here has recovered from the nervousness which was a feature last week owing to the political situation, business is still quiet, buyers operating very sparingly. The small amount of business that has been done recently for shipment to the Near East has ceased and there is no likelihood of revival in that direction until the outlook becomes definitely brighter. Continental trade generally is very sluggish, and oversea business is practically restricted to shipments on Canadian and Australian account and to British Indian buyers.

As regards the home trade, the operation of short-time working in the American section of the cotton trade has had a quieting influence. Other branches of the textile trades, however, as well as the iron and steel and paper industries—all large consumers of chemical products—are reasonably active. Although here and there prices are moving a little in buyers' favour, sellers generally maintain a firm attitude. The opinion is widely expressed that on the whole chemicals have about touched bottom.

Heavy Chemicals

Caustic soda keeps steady at £20 5s. for 60 per cent. material, and £23 5s. per ton for 76 per cent., with a moderately active inquiry from home and foreign consumers. The demand for soda crystals has improved a little, but prices show no change at £5 12s. 6d. per ton, delivered. Bleaching powder is only in moderate demand at £12 10s. per ton, in softwood casks at makers' works. Soda bicarbonate is firm and in fair demand at £10 10s. to £10 15s. per ton in 2 cwt. bags. Saltcake remains steady and still features prominently on the market, a fair amount going into home consumption and also for shipment; quotations are unchanged at £4 5s. to £4 10s. per ton. Sodium sulphide is quoted at £20 per ton for 60–65 per cent. quality, but Continental makes are being offered at below this figure; business, however, is of limited extent. Hyposulphite of soda keeps quiet and prices are a shade lower, photographic quality bringing £18 and commercial £12 per ton. Ammonia alkali, 58 per cent. material, is quoted at £7 17s. 6d. to £8 10s. per ton, in bags, to home consumers. Nitrite of soda is inactive at £28 10s. per ton. The demand for Glauber salts has slackened off again, though the price is unchanged at £4 10s. per ton. Acetate of soda meets with a slightly improved inquiry at £23 10s. to £24 per ton. Chlorate of soda is quiet and supplies are offering freely at about 3d. per lb. Prussiate of soda is steady and in good demand at 11¼d. per lb. Phosphate of soda is quoted at £15 10s. per ton, but sales are slow.

Caustic potash still meets with a fairly active inquiry: 88–90 per cent. strength is quoted at round about £29 per ton, and 75–80 per cent. at £24. Bichromate of potash is firmer at about 6½d. per lb. Carbonate is in quietly steady demand at £29 10s. per ton for 90–92 per cent. material. Chlorate of potash is less active and 4½d. per lb. is about to-day's quotation. Yellow prussiate of potash is still in short supply and offers are firm at 1s. 6d. per lb. with red quoted at 4s. to 4s. 3d. Commercial permanganate is offered freely at 7¾d. per lb.

Among miscellaneous chemical products, sulphate of copper finds a quiet market; prices range between £26 to £26 15s. per ton. Arsenic keeps scarce and prices are well maintained, white powdered, Cornish makes, being quoted at £47 to £48 per ton. Epsom salts, commercial, are quiet and offers vary between £6 and £6 5s. per ton. Grey acetate of lime is in short supply both for prompt and forward, and £14 10s. is still asked, brown bringing £8 10s. White sugar of lead is steady at £38 and brown £34, though Continental supplies of the latter are offering at about £2 per ton less. Flake litharge is moderately active at up to £38 per ton. Nitrate of lead, British makes, is quoted at £42. Ammonium muriate meets with a quietly steady demand from home users but export business is quiet; sellers are asking £35 per ton. Chloride of barium is steady and in moderate inquiry at £19.

Acids and Tar Products

Both tartaric and citric acids are slow of sale and prices are weaker, tartaric being quoted at 1s. 3d., and citric 2s. per lb. Acetic acid is still in fairly active demand but prices are less firm, glacial at about £65 and 80 per cent. technical at £39 per ton. Oxalic acid is still quiet at 7¼d. to 7½d. per lb. Crystallised boracic stands at £60 per ton.

Tar-distillation products maintain their recent position, most of the lines being firm and in steady demand. Pitch finds a ready market for shipment and £4 to £4 5s. per ton f.o.b. is an average price here. Carbolic acid crystals are in good request but supplies are short, and 6½d. to 6¾d. per lb. is asked. Solvent naphtha is quiet at 1s. 11d. per gallon. Naphthalene is also dull; flake is quoted at £16 and crude £4 15s. per ton. Creosote oil and benzol are both steady at 6d. and 1s. 11d. per gallon respectively.

The Nitrate Market

German Negotiations for Chilean Supplies

IN their latest report on nitrate of soda, Aikman (London), Ltd., state that since September 5 the arrivals amount to about 18,000 tons, and about 20,000 tons are due during the next fortnight. The market has been quiet throughout the fortnight, the uncertainty in the political position and the wild fluctuations in Continental currencies deterring consumers from covering their next season's requirements. Dealers have, however, continued to lay in stocks, and the outlook for consumption is regarded favourably.

A few steamer parcels for near arrival have been sold at 11s. 6d. to 12s. 3d. per cwt. c.i.f., according to destination, and closing values are about 11s. 7½d. to 11s. 10½d. August-October shipment, and 12s. to 12s. 4d. per cwt. c.i.f. December-February shipment basis Bordeaux-Hamburg range, with extra freight for special ports. The Producers' Association have sold about 60,000 tons during the fortnight, making their total sales up to date, for delivery after July 1, 860,000 tons.

New German Prices

Increasing costs have resulted in the German inland price for synthetic nitrogen products being raised early this month by 180 per cent., the new prices fixed being for nitrate of soda 292 marks per unit of nitrogen per 100 kilogrammes, against 108·60 marks for sulphate of ammonia 242·20 marks, against 90·20 marks, and for cyanamide 215·60 marks against 80·40 marks. The time when Chilean nitrate can compete in Germany would therefore appear to be nearer. Negotiations still continue for the purchase of Chilean nitrate by Germany, but as it is not required until the turn of the year sales on a large scale are likely to be delayed for some months. In the meantime a few thousand tons are reported to have been bought in exchange for sulphate of ammonia.

The production figures for August were cabled as follows:—

	Tons. 1922.	Tons. 1921.	Tons. 1920.	Tons. 1913
Production. Aug.	96,000	84,000	222,000	242,000
Stocks in Chile, August 31	1,509,000	1,406,000	1,347,000	734,000

The shipment figures for first half September were cabled as follows:—

	Tons. 1922.	Tons. 1921.	Tons. 1920.	Tons. 1913.
Shipments to Europe and Egypt	15,000	—	43,000	71,000
Shipments to United States	20,000	8,000	63,000	16,000
Shipments to Japan and other countries ..	1,000	1,000	4,000	9,000

Plight of Italian Sulphur Industry

COMMENTING on the number of Italian industries that are asking for State aid in order to carry on, the Milan correspondent of the *Manchester Guardian Commercial* states that the Sulphur Consortium is asking for a State guarantee for an immediate issue of bonds to the amount of 120 million lire, to be expended apparently in making advances to individual mining companies, in order to keep them going while the large stocks are gradually cleared. This proposal has already been approved by the Chamber, but has not yet been submitted to the Senate. There is no possibility of such bonds being taken up without a State guarantee, and the condition of the industry is such that if the guarantee is given the repayment of the 120 millions, if not the interest, must almost inevitably fall on the Government.

Company News

AMALGAMATED ZINC (DE BAVAY'S) CO., LTD.—A dividend is announced of 1s. per share, less tax at 5s. in the £.

AMERICAN CYANAMID CO.—A dividend of 1½ per cent. on the preferred stock is payable on October 2 to holders of record September 25.

BRITISH ALUMINIUM CO., LTD.—The directors have declared a dividend on the ordinary shares at the rate of 5 per cent. per annum less tax for the six months ended June 30. For the same period the preference shares receive dividend at the rate of 6 per cent. per annum.

W. AND H. M. GOULDING, LTD.—The net profit for the year ended June 30 amounted to £50,360 (against £52,217 for the previous year), from which, as usual, £7,000 is set aside to cover estimated discounts on realisation of outstanding debts. With £8,505 brought forward the distributable balance amounts to £51,865. The dividend on the ordinary shares for the year is the same as for the previous year, at 8 per cent., of which 4s. per share has been paid and 4s. per share is payable on December 31, less tax. It is proposed to set aside £350 as a bonus to directors, and £7,000 (against £5,000) is carried to depreciation account, leaving £7,940 to be carried forward.

BRYANT AND MAY, LTD.—At an extraordinary general meeting, held at Fairfield Works, Bow, on Wednesday, the following resolution was adopted: "That the directors be authorised from time to time at their discretion to raise or borrow upon such terms and subject to such conditions as they may think fit such sums of money as may be from time to time required for the purposes of the business of the company up to £750,000, and to secure the repayment of the money so raised or borrowed by the issue of mortgage debentures or debenture stock of the company, charged by way of floating charge or security or otherwise upon the whole or any part of the undertaking, property, and assets of the company, in addition to any money already so secured."

BRITISH GLUES AND CHEMICALS, LTD.—In their report for the year to May 31 last, the directors state the balance on profit and loss account, subject to taxation, brought in from last year's accounts amounted to £149,873. Deduct preference dividend paid October 1, 1921, £21,000—£128,873. Deduct net loss for the year, after due allowance has been made for depreciation (£31,275) and bad and doubtful debts, and after providing for the reduction of stocks to market values, £64,177; balance, subject to taxation, £64,696. In view of the trading loss sustained during the year, and the outstanding liability for taxation, the directors do not recommend the payment of dividends on the preference and ordinary shares, and they have waived their fees from August 31, 1921. The improvement in trade which was hoped for at the time of the last annual meeting did not materialise, and the year was one of difficult trade conditions and constantly falling values. These conditions necessitated the writing down of stocks to little more than pre-war values, which, together with the coal strike during the first two months of the year, are the main causes of the company's loss. Considerable improvements have been made in the company's factories, and the cost of production has been materially reduced. The ordinary general meeting will be held at the Cannon Street Hotel on October 5, at noon.

VAN DEN BERGHS', LTD.—The report for the year to December 31 last states that, considering the circumstances, the directors are of opinion that the results are satisfactory. The loss shown is small, having regard to the unprecedented fall in the price of raw materials which began to take place towards the end of 1920, and which continued till well into 1922. The balance brought forward was £635,930; deduct loss for the year after taking into account dividends and distribution satisfied in shares of associated companies, profits and losses of subsidiary companies, and income from trade and reserve investments, £176,867—£459,063. Deduct depreciation, £42,849; directors' and managing directors' remuneration, £37,168; dividend on 90,000 preference shares to August 31, 1921, £18,000; dividend on 1,000,000 "B" preference shares to December 31, 1921, £60,000; dividend on 1,000,000 "C" preference shares to November 30, 1921, £64,167; dividend on 3,750,000 preferred ordinary shares to June 30, 1921, £70,312; leaving £166,566, which it is proposed to apply as follows: Accrued proportion of preference dividend to December 31, 1921, £9,000; accrued proportion of "C" preference dividend to December 31, 1921, £5,833; six months' dividend on 3,750,000 preferred ordinary shares, £70,313—£85,146; less income-tax, £25,544—£59,602; leaving a balance of £106,964. The directors propose that this balance should be carried forward, and they do not therefore recommend the payment of a dividend on the ordinary shares. The ordinary general meeting will be held at Winchester House, London, on October 6, at noon.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OR FIRM OR AGENT.	MATERIAL.	REF. No.
Bratislava.....	Pharmaceutical goods, patent medicines and drugs.	333
Amsterdam ...	Alum formaldehyde, caustic soda, Epsom salts, sulphate of soda, chloride of ammonia, etc.	341
Amsterdam ...	Chemicals, soaps and perfumery	337

Tariff Changes

UNITED STATES OF AMERICA.—The Bill embodying a new Customs Tariff for the United States was signed by the President on September 21, and the new Tariff Act became operative at midnight on the same day. The Board of Trade are in receipt of copies of the Bill as agreed upon in conference between the Tariff Committees of the Senate and House of Representatives, and reported on September 12. It is understood that the Bill was subsequently amended only in respect of the provisions relating to the treatment of dyestuffs and potash. A copy of the "Conference" print of the Bill may be consulted at the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

MALTA.—The importation of opium and other similar specified drugs from the United Kingdom is prohibited, unless a certificate in the following form is obtained from the Superintendent of Public Health: "This is to certify that the drugs listed below required by or on behalf of .... (physician, surgeon, dentist, or chemist) are intended exclusively for legitimate scientific and medical purposes." This certificate must be transmitted by the intending importer together with his order to the intending exporter in the United Kingdom.

HUNGARY.—The importation is prohibited except under licence of stearic acid, degras and oleic acid, coal tar oils of the benzol class, zinc white, zinc grey, sal ammoniac, liquid ammonia, Glauber salt, sodium carbonate, and colours not specially mentioned in the tariff. Superphosphates have been added to the import free list and may now be imported without licence.

VENEZUELA.—Modifications in the scale of import duties allow the free importation of carbonate of potash or soda, salts of potash or soda and white powdered marble. The new rate for potassium hydrate or caustic potash and sodium hydrate or caustic soda is 0·391 bolivar per kilog. including surtaxes.

Institute of Chemistry Students' Association

ARRANGEMENTS have been made for members of this Association to visit the following during the autumn:—Messrs. Van den Bergh's Margarine Factory, Messrs. Whitbread's Brewery, The National Physical Laboratory, Messrs. Duroglass, Ltd., Messrs. Kodak, Ltd., Messrs. John Knight, Ltd. (The Royal Primrose Soap Works). The honorary secretary of the Association is Mr. C. T. A. Garlick, 140, Portsdown Road, Maida Vale, London, W.9.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BELART, —, 179, Roundhay Road, Leeds, chemist. £17 6s. 6d. August 18.

HARDY (H.), LTD., Bulls Head Yard, Manchester, chemist. £18 6s. August 11.

LENGS, LTD., 205, High Street, Acton, chemists. £10 4s. 7d. August 16.

MAYS DISINFECTANTS, Ross Works, Redbridge, manufacturers. £16 18s. 7d. August 8.

NORRIS, Alf., 107-111, Moorgate Station Chambers, E.C., chemical agent. £55 1s. 3d. August 2.

NORRIS BROTHERS, LTD., registered office, 107-111, Moorgate Station Chambers, E.C., chemical merchants. £63 19s. 5d. August 21.

ROBINSON, Henry, 101, The Albany, Old Hall Street, Liverpool, chemical oil and produce broker. £45 4s. 10d. August 18.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BRITISH CELLULOSE AND CHEMICAL MANUFACTURING CO., LTD. (late BRITISH CELLULOSE AND CHEMICAL MANUFACTURING (PARENT) CO., LTD), London, S.W.—Registered August 24, Trust Deed securing £500,000 1st debenture stock and a contingent premium of 5 per cent.; charged on hereditaments at Spondon, 2nd, 3rd and 4th floor offices at 8, Waterloo Place, S.W., 169-171, High Road, Willesden, and land in Derby, also general charge. *£452,500. May 15, 1922.

SMITHSON AND GLEDHILL, LTD., Ravensthorpe, dyers and finishers.—Registered September 15, mortgage, to Equitable Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land and premises at Ravensthorpe.

SUTCLIFFE AND BINGHAM, LTD., Manchester, manufacturers of grocers' and chemists' specialities.—Registered September 13, £10,000 1st debenture, to R. Dobson and another, Mosley Street, Manchester; general charge. *£3,500. April 19, 1922.

TAYLORS' DRUG CO., LTD., Leeds.—Registered September 14, £1,200 mortgage, to B. R. Turner and another, Parkroyd, Gateland Lane, Shadwell, Leeds, auctioneers; charged on 90, High Street, Mexborough; also registered September 18, £1,300 mortgage, to Mrs. L. MacGregor, 2, Duke Street, Manchester Square, W., and others; charged on 60, Blackburn Road, Accrington, with workshop, etc. *£66,168 16s. 2d. November 28, 1921.

Satisfactions

DAWE (J. P.) AND CO., LTD., London, N.W., chemists.—Satisfaction registered September 14, £600, registered September 2, 1921.

SMITHSON AND GLEDHILL, LTD., Dewsbury, dyers and finishers.—Satisfaction registered September 14, £7,500, registered January 19, 1921.

Receivership

S.D.Q. MANUFACTURING CO., LTD.—J. P. Newton, of Long Eaton, ceased to act as receiver or manager on May 9, 1922.

London Gazette

Bankruptcy Information

MAGASINER, George, 178, Brick Lane, London, chemist and dentist. Receiving order, September 20. Creditor's petition. First meeting, October 5, 12 noon. Public examination, December 1, 11.30 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Company Winding up Voluntarily

LEONARD HORNER AND SONS, LTD.—Reginald Guy Sidford, 36, Southampton Street, Strand, London, Incorporated Accountant, appointed liquidator.

Partnerships Dissolved

GILLOCH, WATSON AND CO. (Thomas GILLOCH and Henry James WATSON), white lead, colours, varnish and oil merchants, 79, Mark Lane, London, E.C.3, and 1, Brunswick Street, Poplar, E., by mutual consent as and from June 30, 1922. Debts received and paid by H. J. Watson, who will continue the business.

THE PLUPERFECT LIQUID COMPANY (Sarah Ann THOMPSON, John LAWSON, William WALKER and Alexander Brown WYLIE), manufacturers of a condenser liquid, 33, Rice Lane, Walton, by mutual consent as from June 30, 1922. Debts received or paid by S. A. Thompson, who will continue the business under the style of Thompson and Company.

New Companies Registered

BARRETT, TAGANT AND GOTTS, LTD., Corrisson Works, Wandsworth Bridge, Fulham, S.W. Manufacturers and refiners of and dealers in oils, fats, greases, soap, pharmaceutical preparations, chemicals, etc. Nominal capital, £25,000 in £1 shares.

BOND AND HARDING, LTD., 28, Goose Gate, Nottingham. Dealers in chemists' and druggists' sundries, perfumes, etc. Nominal capital, £1,500 in £1 shares.

CENTRAL PETROLEUM AND GENERAL CORPORATION, LTD., 40-42, Broad Street Avenue, E.C., distillers and refiners of oil, spirits, natural gas, etc.; preparers of oil for sale, and dealers in substances obtained therefrom. Nominal capital, £112,000 in 1s. shares (1,280,000 participating preference and 960,000 ordinary).

R. H. CRAMPTONS, LTD., 172, Claremont Road, Moss Side, Manchester. To take over the drug store carried on by R. H. Crampton at the above address. Nominal capital, £500 in £1 shares.

CRESOLS AND GENERAL ANTISEPTICS CO., LTD., 6, Hardwidge Street, S.E.1. To acquire the business of manufacturers of and dealers in disinfectants, soap, etc., carried on by T. P. Patchin and D. Weir, at 79, Queen Street, E.C. and 6, Hardwidge Street, as "The Cresols and General Antiseptics, Co." Nominal capital, £1,500 in £1 shares.

FLORIAN AND ARMAND, LTD., 5, Harp Lane, Great Tower Street, E.C.3. Manufacturers, importers and exporters of and dealers in oils, acids, paints, alkalis, soaps, etc. Nominal capital, £100 in £1 shares. The directors to be appointed by subscribers.

FREESOL CO., LTD., 79, Queen Street, Cheapside, E.C.4. To acquire the business of manufacturers of and dealers in disinfectants, soap and other articles; carried on by T. P. Patchin and D. Weir as "The Freesol Co." Nominal capital, £100 in £1 shares.

GOODE, CASH CHEMISTS, LTD., 65, Rochdale Road, Bury. To take over the drug business carried on by Mrs. B. Goode at the above address. Nominal capital £500 in £1 shares.

HUGO LORENZ, LTD., 7-8, Idol Lane, E.C. To acquire the business carried on as "Hugo Lorenz," manufacturers of and dealers in farina, dextrine, alcohol, ammonia, potash, soda, salts and pharmaceutical, medicinal chemical, industrial and other preparations, etc. Nominal capital, £7,500 in £1 shares.